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ABSTRACT

Metathesis, usually described in descriptive or historical linguistics as sporadic change, is investigated as a systematic phonological change using data from Gascon, an Occitan dialect. In the first chapter, the controversy over metathesis as a phonological change is presented and discussed from the standpoint of historical development. In contrast to the view that metathesis represents mainly a phonetic output, it is argued that metathesis can be seen as a phonological process following predictable patterns, as illustrated in different diachronic processes occurring in related dialects of Eskimo. In chapter 2, major historical and linguistic factors affecting development of the Gascon dialect are presented, and early analyses of one region's Gascon are examined. The third chapter introduces the data to be analyzed and the theoretical phonological framework for their examination. It is argued that the generative approach does not account adequately for the occurrence of this phenomenon in Gascon. The sociolinguistic approach to rules and one notational system are then used to arrive at the rule account of metathesis. In chapter 4, a discussion of assimilation in Gascon leads to the argument that because assimilation is no longer productive, metathesis occurs as an alternative, supporting the proposed rule account. (MSE)

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Metathesis as a Phonological Process:

A Case Study in Gascon

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INTRODUCTION

Metathesis usually is introduced in the descriptive or historical linguistic literature as a sporadic change. My belief is that such a description is mistaken and may be attributed to the selection, in previous research, of random examples of metathesis of different types with very few systematic studies of this phenomenon within specific languages.

I believe metathesis represents a systematic phonological sound change. In this study, I analyze linguistic data from Gascon, a dialect of Occitan in order to prove that in this dialect metathesis is predictable and rule governed. My analysis here differs from standard treatments in that it restricts examples of metathesis to only one segment type and offers a comprehensive account of these examples for one language.

The study is organized as follows. In Chapter One, the controversy over metathesis as a phonological sound change is presented and discussed from the standpoint of historical development. In contrast to the view that metathesis represents mainly a phonetic output in a language, I argue that metathesis can be shown to be a phonological process following systematic patterns. This is shown by comparing different diachronic processes in related dialects of Eskimo. In Chapter Two, the major historical and linguistic backgrounds affecting the development of the Gascon dialect are presented. An analysis of metathesis by Grammont (1904 and 1933) of the Gascon of Bagnères-de-Luchon is examined. It is shown that Grammont's analysis describes the occurrence of metathesis,

rather than explains why such a process takes place in the Gascon dialect. In Chapter Three, the data to be analyzed are introduced. The data are discussed under the phonological theory of Chomsky and Halle (1968). I argue that the generative model approach does not account adequately for the occurrence of metathesis in Gascon. I present features of the sociolinguistic approach to rules and of the notational system of Bailey (1973) that I use as a basis to arrive at a rule account of metathesis. In Chapter Four, a discussion of assimilation in Gascon leads to my argument that because assimilation no longer is productive, metathesis takes place as an alternative. I demonstrate how and why metathesis occurs each time assimilation does not. This leads to my proposed rule account of metathesis with the conclusion that metathesis is a phonological process amenable to the methods of systematic explanation.

CHAPTER ONE

1.0 Introduction

In this chapter, I examine the controversy over metathesis as a phonological sound change. I discuss two major arguments that have been advanced for rejecting metathesis as a viable process. These arguments are that many examples of metathesis are sporadic and that metathesis reflects mostly a phonetic output in a language rather than a phonological process.

I show that in the case of Castillan Spanish, metathesis cannot be viewed as simply descriptive in nature and that it can coexist with epenthesis and assimilation as a natural sound change arising from a phonotactic constraint. In the case of related dialects of Eskimo, the presence or absence of metathesis explains differences between the diachronic processes exhibited by such dialects. These results support my belief that metathesis is more than a sporadic sound change in these languages and that it can be shown to represent the operation of a phonological process.

1.1 Metathesis: Its representations

Ultan (1971) proposed to examine the following types of transposition of linearly ordered elements:

1) Inversion of syntactic constituents: He was here. vs. Was he here?

2) Transposition of syllables: TOBA (thieves' language): tema < mate 'dead.'

3) Transposition of sounds: irrevelant for irrelevant, or spoonerisms (transposition across word boundary of sounds occupying the same syllabic positions) like: a row of beery wenches for a row of weary benches.

4) Transposition of suprasegmental features: ímport (n.) vs. impórt (v.).

5) Transposition of phonological features: GREEK thriks (nom. sg.) vs. trikhos (gen. sg.) 'hair' (pages 4-5).

These examples are instances of permutation, but the fact remains that they may not be true accounts of metathesis. Accordingly, Ultan (page 7) dismisses most of these types in his typology of metathesis. Thus, type 1 (above) depends on syntactic rules. Type 2 is not phonologically conditioned and does not reflect any natural process in the language. The permutation of syllables in type 2 represents a systematic and socially motivated language code which is used by certain groups of speakers who want to differentiate themselves from other speakers by deliberately permuting syllables in a word and adding others according to certain rules they establish. Type 3 is considered by many to be a true example of metathesis. The examples given for type 3 or any example of that kind, however, must be dismissed. Type 3 transpositions of sounds affect the performance of the speaker, not his/her competence. They occur occasionally in the grammar of some speakers but not in all.

Therefore they do not represent instances of metathesis but rather simple slips of the tongue. Type 4 is based on a morphological difference (noun vs. verb). Type 5, which is the only formal type of metathesis retained by Ultan, also is the most debated one and is at the center of the controversy as to whether or not metathesis can truly reflect a phonological process. A detailed discussion of this controversy will follow in 1.3 and 1.4.

1.2 Metathesis and syllabic liquids

A word may reflect an apparent metathesis that is not the result of an actual phonological process. For example, take the Latin word vervēcem and its form in Modern French: brebis 'ewe.' Here we are dealing with a metathesis rule of the type: Vowel + Liquid > Liquid + Vowel (i.e. er > re). Quite a few examples of this type of permutation in syllable initial position occur in French:

	Latin		French	
1.	vervēcem	>	brebis	'ewe'
2.	vervecariam	>	bergère	'shepherdess'
3.	formáticu	>	fromage	'cheese'
4.	túrbulu	>	trouble	'turmoil'
5.	tórculu	>	treuil	'winch'

For purposes of illustration, only of few of many examples are cited here. They are significant because no recognizable pattern of syllable stress explains why metathesis takes place in these cases. In examples 1,2 and 3, the initial syllable is unaccented, in 4 and 5, it is accented; yet metathesis occurs in both instances. Furthermore, in the case of 1 and 2, the intermediate stage in Old French yields the following contrasting derivation in the Vowel + Liquid permutation:

	Latin		Old French		French
1.	vervēcem	>	berbice	>	brebis (i.e. er >er > re)
2.	vervecāriam	>	bregière	>	bergère (i.e. er > re > er)

Galliot (1967: 239) explained that in words such as those above the strong vibration caused by the articulation of Old French apical (trilled) /r/ affected the whole syllable. Thus, according to him, in pronouncing the word berbice, speakers could not tell if /r/ preceded or followed the vowel /e/ in the vibration process. This illustrates the contrasting derivations in examples 1 and 2.

As will be seen in the discussion of Grammont's 1904 and 1933 rules for metathesis in the Gascon of Bagnères-de-Luchon, quite a few examples exist of the Vowel + Liquid > Liquid + Vowel type of permutation. It will be shown, however, that this type of permutation does not reflect the occurrence of phonological metathesis but, as in examples 1 and 2 in French, represents the phonetic output resulting from the syllabicity of the liquid /r/.

1.3 Metathesis and the historical development of languages

To understand the controversy surrounding metathesis as a legitimate historical sound change, let us turn to the contrasting analyses of sound changes in Old Greek by Kiparsky (1967) and Jeffers and Lehiste (1982). In a discussion of sonorant clusters in Greek, Kiparsky (page 620) proposed that metathesis applies in the following examples: (1) *phanyō > phaínō 'show,' (2) *morya > moira 'fate,' and (3) *dawyō > *daywō > daíō 'kindle.' Kiparsky remarked that in the case of nasals and liquids (i.e., examples 1 and 2), metathesis takes place only after /a/ and /o/. Kiparsky's rule for metathesis (page 623) is given in Rule 1.

Rule 1: Metathesis

$$[-\text{ consonantal}] \quad \left[\left(\left[\begin{array}{l} -\text{ obstruent} \\ -\text{ vocalic} \\ +\text{ diffuse} \\ +\text{ grave} \end{array} \right] \right) \left[\begin{array}{l} -\text{ vocalic} \\ -\text{ consonantal} \\ -\text{ rounded} \end{array} \right] \right]$$
$$[+\text{ consonantal}]$$

1 2 3

Structural Change (SC): 1 2 3 ⟶ 1 3 2

Kiparsky remarked that other linguists viewed metathesis in Old Greek as a series of sound changes involving the palatalization of sonorants before /y/. The palatalization approach also was taken by Jeffers and Lehiste (pages 8 and 9) to account for the change exemplified in example 2 and in another example (4): *banyō > bainō 'I go.' The palataliza-

tion rule suggested by Jeffers and Lehiste can be formulated as follows in Rule 2.

Rule 2: Palatalization

$$\text{Nasal} \longrightarrow \begin{bmatrix} + \text{high} \\ - \text{ant} \\ - \text{cor} \end{bmatrix} / __ \begin{matrix} \text{Glide} \\ [- \text{back}] \end{matrix}$$

Rule 2 produces the following change in example 4: *banyō̃ > baɲyō̃. Jeffers and Lehiste argued further that since a nonpalatal vowel (/a/) is adjacent to a palatalized consonant (/ɲ/), a transitional sound is needed, in this case an epenthetic /i/: (4) baɲyo > baiɲyo. According to them, the glide following the palatalized consonant is lost and eventually the palatalized consonant becomes depalatalized: (4) baiɲyō̃ > baiɲō̃ (loss of /y/) and baiɲō̃ > bainō̃ (depalatalization). In support of the palatalization rule, Jeffers and Lehiste remarked that this series of sound changes (palatalization, loss of /y/, and depalatalization) was widespread and occurred in many other developments in Old Greek. According to them, metathesis describes the phonetic output of these words in Greek but does not reflect their historical development. In support of the metathesis rule, however, it should be noted, as Kiparsky remarked, that a palatalization of /w/ in example 3 (*dawyō̃ > daíō̃) would be hard to explain.

1.4 Metathesis and abstract underlying representations: Discussion of Kasem metathesis

A major problem in the study of metathesis is that many analyses have drawn from examples that require underlying representations so abstract they could be reinterpreted under more natural rules. The extensive literature criticizing Chomsky and Halle's (1968) analysis of metathesis in Kasem bears witness to this fact (see, e.g., Howard (1969), Crothers and Shibatani (1973), and Foley (1977)).

Chomsky and Halle's discussion is based on a previous analysis of Class-C nouns in Kasem by Callow (1965). For ease of presentation, only six words in the data are discussed here.

	Singular	Plural	
1.	kukuda	kukudi	'boy(s)'
2.	kambia	kambi	'cooking pot(s)'
3.	pia	pi	'yam(s)'
4.	pia	pɔ̀æ	'sheep'
5.	laŋa	lɔ̀æ	'song(s)'
6.	naga	nɔ̀æ	'leg(s)'

Class-C nouns add the suffix -a to the stem to form the singular, and the suffix -i to the stem to form the plural (e.g., in (1), kukud + a (in the singular), kukud + i (in the plural)). When a word ends in two identical vowels, one of the vowels is truncated. Thus in

(3), for example, pia + a →pia, pi + i →pi. Chomsky and Halle (page 359) proposed a vowel truncation rule as follows in Rule 3.

Rule 3: Vowel truncation

$$\begin{bmatrix} -\text{ cons} \\ \gamma\ \text{high} \\ \beta\ \text{back} \end{bmatrix} \longrightarrow \emptyset \ / - \begin{bmatrix} +\text{ voc} \\ -\text{ cons} \\ \gamma\ \text{high} \\ \beta\ \text{back} \end{bmatrix}$$

To explain the plural forms in examples 5 and 6 (læ and næ), Chomsky and Halle proposed a velar elision rule and a vowel contraction rule which apply to the underlying forms of (5) (læŋ + i (plural suffix)) and (6) (næg + i). Chomsky and Halle's velar elision rule (page 359) is as follows in Rule 4.

Rule 4: Velar elision

$$\begin{bmatrix} +\text{ cons} \\ -\text{ ant} \\ -\text{ cor} \end{bmatrix} \longrightarrow \emptyset \ / - \begin{bmatrix} +\text{ voc} \\ -\text{ cons} \\ +\text{ high} \\ -\text{ back} \end{bmatrix}$$

The vowel contraction rule (page 360), where ai ⟶ æ , is given in Rule 5.

Rule 5: Vowel contraction

Structural Description (SD):

$$\begin{bmatrix} +\text{ voc} \\ -\text{ cons} \\ -\text{ high} \\ +\text{ back} \\ -\text{ round} \end{bmatrix}_1 \quad \begin{bmatrix} -\text{ cons} \\ +\text{ high} \\ -\text{ back} \end{bmatrix}_2$$

Structural Change (SC) :

$$1\ 2 \longrightarrow \begin{bmatrix} 1 \\ -\text{ back} \end{bmatrix} \quad \begin{bmatrix} 2 \\ \emptyset \end{bmatrix}$$

The surface form of the words in examples 5 and 6 can be derived as follows:

Plural

Underlying Representation (UR):	lagi	nagi	
1:	lai	nai	(Rule 4: Velar Elision)
2:	læ	næ	(Rule 5: Vowel Contraction)
Surface Representation (SR):	læ	næ	

When Rules 3 and 5 are applied to the underlying forms of examples 3 and 4, the following surface representations are derived:

	'yam(s)'		'sheep'		
	Sing.	Plur.	Sing.	Plur.	
UR:	pi + a	pi + i	pia + a	pia + i	
1:	_____	pi	pia	_____	(Rule 3: Vowel Truncation)
2:	_____	—	—	pie	(Rule 5: Vowel Contraction)
SR:	pia	pi	pia	*pie	

The application of Rules 3 and 5 yields the wrong plural form for 'sheep': *pie instead of pɛ.

Chomsky and Halle (page 360) posited two different stems in the singular and plural for 'sheep' which seem to be related by metathesis: pia + a (sing.) and pai + i (plur.). They then proposed a metathesis rule (Rule 6) applying only to the underlying stem [pia] in the plural form (page 361).

Rule 6: Metathesis

$$\text{SD: } \begin{Bmatrix} +\text{voc} \\ -\text{cons} \end{Bmatrix}_1 , [-\text{cons}]_2, \begin{Bmatrix} +\text{voc} \\ -\text{cons} \end{Bmatrix}_3$$

$$\text{SC: } 1\ 2\ 3 \longrightarrow 2\ 1\ 3 \text{ except when } 2 = 3 = [a]$$

Rule 6 now yields for the word 'sheep':

	Sing.	Plur.	
UR:	pia + a	pia + i	
1:	_____	pai + i	(Rule 6: Metathesis)

2:	pia	___	(Rule 3: Vowel Truncation)
3:	___	p æ	(Rule 5: Vowel Contraction)
SR:	pia	p æ	

This account of metathesis in Kasem was criticized extensively on the grounds that the analysis was so abstract as to be ahistorical. Callow (pages 30-31) had given the following combination rules: ea ⟶ ia for the singular, and ei ⟶ e for the plural (note that e = /æ/ in Chomsky and Halle). Based on Callow's combination rules, Crothers and Shibatani (page 528) proposed a vowel-raising rule and a vowel-shortening rule which apply to the stem /pæ/. The vowel-raising rule and the vowel-shortening rule can be formulated as follows in Rules 7 and 8.

Rule 7: Vowel-raising

æ → i / a

$$\begin{bmatrix} +\text{voc} \\ -\text{cons} \\ -\text{high} \\ -\text{back} \\ -\text{round} \end{bmatrix} \longrightarrow [+\text{high}] \; / \; - \begin{bmatrix} +\text{voc} \\ -\text{cons} \\ -\text{high} \\ +\text{back} \\ -\text{round} \end{bmatrix}$$

Rule 8: Vowel-shortening

	ə		i
SD:	+ voc		+ voc
	- cons		- cons
	- high		+ high
	- back		- back
	- round		
	1		2

SC: 1 2 ⟶ 1 ∅

Rules 7 and 8 produce, for the word 'sheep':

	Sing.	Plur.	
UR:	pə + a	pə + i	
1:	pia	_____	(Rule 7: Vowel-raising)
2:	___	pə	(Rule 8: Vowel-shortening)
SR:	pia	pə	

Crothers and Shibatani agreed that in the case of the above analyses, no underlying representation could be established with certainty. However, they ruled out Chomsky and Halle's interpretation on the grounds that no actual alternation showed any metathesis in any of the data.

1.5 Metathesis and the phonotactic constraints of languages

One specific constraint for any language is the number of possible segments or sequences of segments allowed by the phonology. The following example, taken from Spanish phonology, illustrates this point. As part of the diachronic processes in Spanish, the following sound change occurs: Occlusive + Liquid > Liquid + Occlusive.

	Latin	Old Spanish	Modern Spanish	
1.	gĕn(ĕ)ru	*genru	yerno	'son-in-law'
2.	cĭnĕrata		cernada ~ cendrada	'ashes'
3.	*oblītāre		olvidar	'to forget'
4.	*ten(ĕ)rum		tierno	'tender'
5.	ven(ĕ)ris		viernes	'Friday'
6.	spat(ŭ)la		espalda	'shoulder'
7.	*venra	verna ~ verra	vendra	'he will come'

The above list represents only some of the words metathesized in the development of Castillan Spanish, but it does illustrate the fact that the phonology does not allow certain consonants clusters. This produces the following sound changes: /nr/ > /rn/ (ex. 1,2,4,5, and 7), /tl/ > /ld/ (ex. 6) and /bl/ > /lv/ (ex. 3). Examples 2 and 7 are of considerable importance to our analysis. Since the cluster /nr/ is not permitted (Hooper 1976: 221), either a permutation of segments (/nr/ > /rn/), or the insertion of a stop (/nr/ > /ndr/), or assimilation (/nr/ > /rr/) results.

Metathesis may coexist with epenthesis and assimilation as a natural sound change arising from a phonotactic constraint. Let us see how it can relate to other historical processes within a language.

1.6 Metathesis as a systematic phonological process

Duménil (1979) compared the main diachronic sound changes in four related dialects of Eskimo: Barrow (B), Mackenzie (M), Wales (W), and Greenlandic (G). In the data collected, 54 words appeared in each of the four dialects together with the form of these words in their parent dialect (Ancient Inupik) and their prototype (Proto-Eskimo). Among the diachronic rules established, some were common to all four dialects. For example, palatal and velar fricatives become voiceless stops in final position:

	Proto-Eskimo	Ancient Inupik	B, M, W, G	
1.	*auɣ	*auk	auk	'blood'
2.	*nuRRaR	*nuRRaq	nuRRaq	'fawn'

The four dialects also undergo anticipatory assimilation (partial or complete):

	Proto-Eskimo	Ancient Inupik	B, M, W, G	
3.	*tamlu(R)	*tavlu(q)	tavlu/talu(q)	'chin'
4.	*milnuq		miʃʃuq	'beetle'

Aside from their common devoicing/defricativization in final position and the assimilation process, a unity of pattern emerges in the sound changes undergone by three dialects, whereas the fourth systematically indicates a different directionality of change. In a consonant cluster made up of a fricative or a nasal followed by a stop, anticipatory assimilation occurs. The fricative or nasal becomes a stop in Barrow, Mackenzie, and Wales; in Greenlandic, the fricative remains and the nasal becomes a fricative:

	Proto-Eskimo	B, M, W	G	
5.	*qiɣtuRiaq	kiktuRiaq	qiɣtuRiaq	'mosquito'
6.	*taRtu	taqtu	taRtu	'kidneys'
7.	*miinqun	mitqun	miRqun	'needle'

This dichotomy in the diachronic sound changes undergone by these dialects is exemplified further in a sound change involving one member of a consonant cluster. For the data collected, in seven clusters involving two sonorants or a sonorant and a continuant, the clusters were metathesized in Greenlandic (in five cases) but not in the other dialects (except for one word (9)). The list of changes is given below:

	Proto-Eskimo	Ancient Inupik	B, M, W	G	
8.	*qitunRaR	*qitunRaq	qitunRaq	qituRnaq	'son'
9.	*tuunRaR	*tuuRnaq	tuuRnaq	tuuRnaq	'devil'
10.		*upin Raq	upinRaq	upiRnaq	'stomach'
11.	*əlvi	*əlvi	ilvi	ivli	'thou'
12.	*malRu	*malRuk	malRuk	maRluk	'fifty'
13.	*qaRlu	*qaqlu	qaRluq	qaRluq	'upper lip'
14.	*tamlu(R)	*tavlu(q)	tavlu	tavluq	'chin'

Thus we have the following metathesized clusters in Greenlandic:

(a) *nR > Rn (Ex. 8, 9, 10)

(b) *lv > vl (Ex. 11)

(c) *lR > Rl (Ex. 12)

and the following nonmetathesized clusters:

(d) *Rl > Rl (Ex. 13)

(e) *ml > vl (Ex. 14)

As already mentioned, a systematic sound change involving anticipatory assimilation before a stop occurs in three of the dialects but not in Greenlandic (see examples 5, 6, and 7). Swadesh (1952: 29) explained that Barrow, Mackenzie, and Wales admit clusters of combination with force of articulation strong-strong (e.g., qt), weak-weak (e.g., lR), weak-nasal (e.g., Rn), or nasal-nasal (e.g., ŋm), but that "Greenlandic departs from the general pattern by having weak-strong

in place of strong-strong, except that it does admit ts " (page 29). Swadesh added "Greenland also has tl, but does not allow l as the first element of clusters " (page 29). To my knowledge, Swadesh does not specify how he establishes his criteria for strong and weak consonants, but designates the stops /p, t, k, q/ as the strong series in relationship to the weak continuants / v, j, l, ɣ, R/.

Swadesh's theory can be used to explain why Greenlandic differs from the other three dialects in the pattern of consonant assimilation of clusters. His theory illustrates the outcome of the sound changes exemplified in examples 5, 6, and 7: in Barrow, Mackenzie, and Wales, a strong-strong cluster occurs; in Greenlandic, a weak-strong cluster occurs. However, this weak-strong pattern does not explain the presence of metathesis in clusters (a), (b), and (c) or the absence of metathesis in clusters (d) and (e).

In these clusters, notice that those with the quality [- grave] in the first member of the proto-form undergo metathesis (i.e., (a), (b), and (c)). The clusters do not metathesize where the first members of the clusters are [+ grave] (i.e., (d) and (e)). We can infer from this that the absence or presence of the feature [grave] is associated with the two different patterns.

The observed systematic difference between the phonological processes in Barrow, Mackenzie, and Wales and that in Greenlandic may be explained as follows:

Greenlandic	Barrow, Mackenzie, Wales
1. In a consonant cluster, metathesis takes place if in the proto-form the first member is a sonorant which is [- grave] (see examples 8, 10, and 12 above)	1. No metathesis takes place
2. In a consonant cluster, no change or assimilation in terms of manner of articulation takes place if the initial member of the cluster is [+ grave] (see examples 5 and 6 above)	2. Assimilation takes place: a fricative becomes a stop before another stop
3. In a consonant cluster, if the first member is [- grave] it becomes [+ grave] if the second member is [+ grave] (see example 7 above)	3. The first member of the cluster remains [- grave] if the second member is [+ grave]

Furthermore, the two exceptions to the pattern weak-strong that Swadesh formulated for Greenlandic are not exceptions in this system. The clusters ts and tl are both possible since they exhibit the pattern [- grave], [+ grave] and are not subject to the constraints outlined above.

1.7 Conclusion

In this chapter, the status of metathesis was examined and the controversy over metathesis as a phonological process was discussed. Ultan (page 8) remarked that metathesis is considered a recessive process. I believe this explains why, in many cases, examples exhibiting metathesis in a language have been refuted and reinterpreted in light of more prominent processes (see the analysis of Old Greek sonorant clusters in § 1.3). Other limitations placed on metathesis are that it can be sporadic and may not reflect an actual alternation in the language investigated (see § 1.4) or that it may, in some cases, reflect a phonetic output (see the discussion in Old French in § 1.2 and the controversy in the analysis of Greek sonorant clusters). However, I believe metathesis can be shown to be a systematic process subject to the phonotactic constraints of a language (see § 1.5). Moreover, the comparative analysis of diachronic sound changes in four related dialects of Eskimo (see § 1.6) supports the hypothesis that metathesis is not sporadic. Further evidence that metathesis may represent a systematic phonological sound change will be established in the study of metathesis in Gascon in Chapter Four.

CHAPTER TWO

2.0 Introduction

In this chapter, I introduce Gascon, a dialect of Occitan, as the major linguistic tool for my analysis of metathesis. I selected Gascon for two reasons:

(1) Gascon is a dialect that has undergone many cases of metathesis and thus provides ample documentation for data purposes.

(2) Moreover, the segments involved in the metathesis process (i.e., clusters of Stop + Liquid) are the same as those involved in assimilation in Gascon. This provides a basis for investigating how the two processes relate to one another.

In addition to presenting the historical developments of Gascon, I examine two previous analyses of metathesis in Gascon published in 1904 and 1933 by Grammont. In both analyses, the data gathered by Grammont included words that exemplify a Vowel + Liquid type of permutation together with a Consonant + Liquid type of permutation. I argue that only one of these types of permutation (Consonant + Liquid) represents phonological metathesis in Gascon; and that, overall, Grammont's rules do not provide a coherent phonological explanation of metathesis in Gascon.

2.1 Gascon: History

Julius Caesar's Aquitania originally covered a geographical area bounded by the Garonne river, the Atlantic Ocean, and the Pyrenees. Under the romanization of Gaul, this territory was extended from the Garonne river to the Loire river. Afterward, the name Aquitania was used to refer to the geographical area between the banks of the Lower Garonne and became known as (La) Guyenne: Aguidania > OFr. Guiaine (Rohlfs 1970: 18) (see Appendix A).

The original territory covered by Caesar's Aquitania became modern Gascony, first referred to in the 4th century (Rohlfs, page 18). Vasconiae saltus referred to the Pyrenees mountains, and Vasconia was the territory of the Vascones, nowadays modern Basques. According to Rohlfs, there was no discrimination between the Vascones, who lived in the Southern Pyrenees, and the peoples of the Northern Pyrenees. The main reason for this undifferentiated grouping was that the inhabitants of the Pyrenees, whether North or South, had resisted the Latin influence and thus were considered to be barbarians. By extension, the name Vasconia came to be used to refer to all the inhabitants of what originally was Aquitania: Vasconia [waskɔnja] > Gascogne.

2.2 Gascon: Linguistic background

Much has been discussed about the origin of the Aquitani, the inhabitants of Aquitania. According to Baldinger (1958: 278-79), as early as the 1st century BC a Roman historian (Strabon) remarked that the Aquitani differed very much from the Galli (in Gaul) not only in their physical appearance but also in their language, which was closer

to that of the Iberians. Baldinger (page 279) suggested that the Aquitani may have been of pre-Celtic origin, even pre-Indo-European. He cited a study which showed ten times more words of pre-Indo-European origin present in Gascon and Aragonese than Celtic.

According to many scholars, the language of the Aquitani was closely related to that of the Vascones, the Basques' ancestors prior to romanization. Luchaire (1877) stated:

> De cet ensemble de preuves il ressort clairement, si nous ne nous trompons, que la langue des Aquitains était comme l'idiome ibérien de l'Espagne, de la même famille que celle des Basques actuels; que son domaine s'étendait à peu près, du temps de César et de Strabon, sur la même région que celle où on parle aujourd'hui le dialecte gascon...; que cet ancien idiome, supplanté par le latin populaire, a laissé des traces de lui-même dans les noms propres que les anciens ont cités, dans le vocabulaire et la constitution phonique du gascon, et dans les noms de lieux de la région pyrénéenne (page 69).

The ethnic and linguistic unity of the Aquitani and the Basques is well documented. Many names given to cities and people in Gascony bear witness to Gascony's common background with the Basques. For example, the following last names in Gascon (Gasc.) correspond to modern Basque (Bas.) names (Rohlfs, page 21):

Gasc.	Andere:		Bas. andere	'dame'
	Cison :		gizon	'man'
	Belex :		beltz	'black'
	Oloron:	< Illuro	Illuro	'Basque god'

The linguistic relation between Gascon and Basque also is illustrated in a core vocabulary they share with Aragonese and Catalan. These words are terms of the Pyrenees, linguistically more isolated, and refer to the names of plants and animals, to pastoral terminology, and to terrain configuration (Rohlfs, pages 40-54).

Bas. arto	'green oak tree'	:	Gasc. artach	'small tree'
askarra	'maple'	:	escarroue	'field maple'
garratz	'berberis'	:	garracho	'small holly tree'
arrano	'eagle'	:	arriang	'kind of vulture'
kaparra	'thorn'	:	caparro	'lice of ewes'
lapar	'thorn'	:	laparrou	'lice'
bizkarratu	'to peel'	:	biscarra	'to shear'
zarpa	'pocket'	:	sarpo	'bag of shepherds'
lutho	'hole, cave'	:	ludo	'shelter under a rock'
labar	'edge of ravine'	:	labardau	'torrent'

Besides Basque, the Gascon language reflects idioms from Aragonese and Catalan and has borrowed many words from Spanish. As for the original language of the Aquitani, Rohlfs suggested it resisted the Latin influence and is spoken nowadays by the modern Basques.

2.3 Gascon: Discussion of old documents

Wherever possible, the corpus presented in Chapter Three contains, beside the synchronic reflex of each word, the form and date of the word as confirmed by Old Gascon documents. The date for

the major sound change however, is approximate. The oldest manuscripts in Gascon do not necessarily give us the vernacular form of the language. This information appears in relatively more recent documents. The oldest change attested can be found in the Charte de Montsaunès, a document written about 1160 (Baldinger 1962: 334-36), and reflects an assimilation process: Old Provençal mandad: Gasc. manad 'requested.' Only in a later chart, dating from 1179 and written at the Abbey of Montsaunès, do changes particular to Gascon appear. The earlier occurrence of these sound changes may be illustrated with an example concerning the following process in Gascon: Lat. /f/ > Gasc. /h/.

In a careful examination of old documents, Baldinger showed that Gascon scribes did not write in their own language, which they considered a dialect, but attempted to use a more prestigious model, Old Provençal. According to Baldinger, Gasc. /h/ must have been considered particularly vulgar; the scribes systematically replaced this native /h/ by what they presumed corresponded to an earlier /f/ in Old Provençal. Their corrections indicate systematic respelling. Lat /f/ was confused with Germanic (Gmc.) /h/. (For example, Gmc. hutica 'basket,' thought to be an Old Provençal word, was respelled fuche; the word in Old provençal actually was ucha).

2.4 Gascon: Diachronic phonology

According to Luchaire (1881: 203), the phonology of Gascon can be described in terms of seven characteristic sound changes. These

changes are exemplified in the following Gascon sentence from Baldinger (1958: 244-46):

Dehora, ua bera gojata e un beth gojat que
Dehors, une belle fille et un beau garçon

henen e qu' arresagn lenha trende dab eth
fendent et scient du bois tendre avec

son vielh pai.
leur vieux père.

1. Lat. /f/ > Gasc. /h/ (first attested in 1200)
   - findĕre > henén 'split'
   - *buffāre > bouhá 'to blow'
   - confīne > couhí 'terrain marker'
2. Lat. /n/ > Gasc. Ø / V — V (first attested in 1179)
   - ūna > úa 'a, one'
   - farīna > haría 'flour'
3. Lat. /ll/ > Gasc. /r/ / V — V (first attested in 1179)
   > Gasc. /t/ / — # (first attested in 1200)
   - bella > béra 'beautiful'
   - gallīna > garía 'hen'
   - gallu > gát 'rooster'
4. Lat /nd/ > Gasc. /n/ (first attested in 1160)
   - findĕre > henén 'split'
   - mĕrendāre > brená 'to taste'
   - landa > lána 'land'

5. Lat. /mb/ > Gasc. /m/ (first attested in 1179)

camba > cámo 'leg'

pălumba > palóumo 'wild pigeon'

6. Lat. /v/ > Gasc. /b/ / # — (first attested in 1179)

vet(ŭ)lum > biélh 'old'

vacca > bácca 'cow'

7. Lat. Ø > /a/ / # — /r/ (first attested in 1179)

*resĕcāre > arreségan 'to saw'

rīvum > árriu 'creek'

In addition to these seven characteristic sound changes, Baldinger mentioned metathesis (for example, tén(ĕ)ru > trénde 'tender' in the Gascon sentence) as being "particulièrement fréquente en gascon" (page 246). A discussion of Grammont's rules for metathesis follows below in § 2.5.

2.5 Grammont's (1904) analysis of metathesis in Gascon

Grammont discussed the phenomenon of metathesis in Gascon in 1904 and again later in 1933. Here I concentrate on his 1904 study, which deals specifically with the Gascon of Bagnères-de-Luchon. In a later section (§ 2.5.2), I compare it with his 1933 analysis, a broader study of metathesis occurring cross-linguistically.

In his 1904 study, Grammont remarked that the segments primarily involved in metathesis in Gascon are /r/ and /l/ and that metathesis does not occur when /r/ or /l/, whether in implosive or explosive position, belong to an initial stressed syllable. The following illustration of /r/ in implosive and explosive position is given by Grammont (page 74):

explosive position	implosive position
prat 'meadow'	cordo 'rope'
greso 'grease'	porto 'door'

According to Grammont, metathesis can take place only in a word where the liquid (/r/ or /l/) is in a poststress position, or in a word where the initial syllable is unstressed.

Rule 1:

"In a consonant cluster made up of a Stop + Liquid in an unstressed syllable, a liquid moves immediately after the stop in initial position of a preceding stressed syllable " (page 74). [1]

	Lat.		Gasc.	
1.	cápra	>	crábo	'goat'
2.	páup(ĕ)ru	>	práube	'poor'
3.	cămĕra	>	crámbo	'room'
4.	tén(ĕ)ru	>	trénde	'tender'
5.	spín(ŭ)la	>	esplíngo	'pin'

Grammont explained that the phonology of Gascon has a tendency to eliminate clusters comprised of a Stop + Liquid. This tendency is reflected in the following synchronic processes of anaptyxis (vowel insertion) and gemination (pages 74-75):

	Gasc.	Fr.	
a.	arrebugérit	rabougri	'stunted'
b.	liberáyre	libraire	'bookseller'

c.	fabarico	fabrique	' factory'
d.	dubblo	double	'double'
e.	mirraggle	miracle	'miracle'

In examples a, b and c, a vowel is inserted between the stop (/b/) and the liquid (/r/). In examples d and e, the stop (/b/ or /g/) becomes a geminate.

Grammont proposed four restrictions to Rule 1:

A. A liquid moves immediately after a vowel in initial position of a preceding stressed syllable. No metathesis occurs when the liquid belongs to a stressed syllable (page 76): [2]

	Lat.		Gasc.	
6.	*operio	>	orbi	'I open' (metathesis)
7.	Aprile	>	abryew	'April' (no metathesis)
8.	apricu	>	abric	'shelter' (no metathesis)

B. No metathesis occurs when the vowel of the initial stressed syllable is followed by a consonant in implosive position (page 76): [3]

	Lat.		Gasc.	
9.	ustulat	>	uscle	'he burns'
10.	*ascla	>	ascle	'log'

C. No metathesis occurs when the initial consonant of the stressed syllable is a continuant (page 76): [4]

	Lat.		Gasc.	
11.	cing(u)la	>	singlo	'belt'
12.	*misc(u)lat	>	mescle	'he mixes'
13.	die-Veneris	>	diuendres	'Friday'

D. No metathesis occurs in the cluster /str/ (page 77): [5]

14. fĕnĕ́stra > hyéstro 'window'
15. măgĭ́stru > méstre 'master'

Rule 2:

" A liquid in a consonant cluster following a prestressed syllable moves to an implosive position in that prestressed syllable" (page 83):[6]

	Lat.		Gasc.	
16.	cŏŏp(ĕ)rí̆re	>	curbí	'to cover sowed wheat'
17.	discŏŏp(ĕ)rí̆re	>	descurbí	'to discover'
18.	cup(ĕ)rā́re	>	curbá	'to recover'

Grammont proposed three restrictions to Rule 2:

A. When the prestressed syllable starts with a vowel, no metathesis takes place (page 84): [7]

	Lat.		Gasc.	
19.	aprī́le	>	abryéw	'April'

B. If there is a consonant in implosive position in the unstressed syllable, the liquid forms a cluster with the initial stop of that unstressed syllable (page 85): [8]

	Lat.		Gasc.	
20.	comparā́re	>	crumpá	'to buy'
21.	excombrā́re	>	escrumbá	'to sweep'
22.	*vesperā́culu	>	brespálh	'evening snack'

C. No metathesis takes place when the unstressed syllable starts with a continuant (page 85): [9]

	Lat.		Gasc.	
23:	mĭscŭlā́re	>	mesclá	'to mix'

Rule 3:

"In an initial unstressed syllable, a liquid moves to an implosive position if it was not in implosive position originally" (page 86): [10]

	Lat.		Gasc.	
24.	corbíc(ŭ)la	>	corbélho	'basket'
25:	*pratína	>	pardýo	'meadow'

(In example 24, /r/ already is in implosive position in Latin, and thus remains in that same position in Gascon. In (25), /r/ is in explosive position in Latin and moves to an implosive position in Gascon: ra > ar).

Grammont proposed the following restriction to Rule 3: The liquid does not remain in implosive position when it precedes (pages 87-88): [11]

A. A nasal consonant (unless the word starts with /m/ or /h/):

26.	Fr. gourmand	> Gasc.	grumánt	'greedy'
27.	Lat.formīcam	> Gasc.	hourmígo	'ant'
28.	Fr. marmite	> Gasc.	marmíto	'pot'

B. An /s/:

29.	Lat. persĭcu	> Gasc.	présec	'peach'

C. A semi-vowel (/w/):

30. Fr. tiroir > Gasc. triwér 'drawer'

D. /b/ < /v/:

31. Lat. corvaciu > Gasc. crubás 'raven'

Rule 4:

"A cluster Stop + Nasal becomes Nasal + Stop in intervocalic position" (page 89): [12]

32. Lat. pect(ĭ)ne > Gasc. pyénte 'comb'

Rule 5:

"An unusual cluster is replaced by an ordinary one" (page 90): [13]

33. Lat. nūtrīre > Gasc. newrí 'to nourish'

34. Lat. putrīre > Gasc. pewrí 'to decay'

(By "unusual" (French: insolite), Grammont probably meant that an intervocalic cluster /tr/ was not permitted in Gascon.)

2.5.1 Discussion of Grammont's (1904) rules

Rule 1 appears to contradict Rule 2: a liquid moves to a stressed syllable (Rule 1) but also moves to an unstressed syllable (Rule 2). Moreover, Grammont does not explain why in Rule 1, a liquid moves to a stressed syllable whether that syllable starts with a consonant or a vowel while in Rule 2, a liquid moves to an unstressed syllable only if that syllable starts with a consonant but not if it starts with a vowel.

Rule 5 conflicts with Rule 2. Example 34 (putrīre > pewrí) of Rule 5

has the required structural description that permits metathesis in Rule 2, but the sound change exemplified in example 34 is assimilation rather than metathesis. Rule 3 and its restriction involve a permutation between vowels and liquids in contrast with Rules 1, 2, 4, and 5 which involve permutations between stops and liquids. In § 2.5.2, I demonstrate in the discussion of Grammont's (1933) rules that the Vowel + Liquid > Liquid + Vowel type of permutation in Gascon should be viewed as a phonetic output and not as a phonological process in Gascon. I also find counterexamples to some of the restrictions mentioned by Grammont. Thus, for example, metathesis takes place in other areas of Gascony in the case of the cluster /str/ (see restriction D (Rule 1), where fĕnĕstra becomes hríeste.

2.5. 2 Grammont's (1933) analysis of metathesis

Rules 4 and 5 are not included in Grammont's (1933) study. Rules 1, 2 and 3 (see § 2.5), together with the restrictions to each rule, are collapsed under one single rule with a series of restrictions. The new single rule is as follows in Rule 6.

Rule 6: Metathesis

"In a consonant cluster in a noninitial position, a consonant (most often /r/ or /l/ moves next to the initial consonant of the initial syllable" (page 339). [14]

(Note that in Rule 6, no mention is made of a pretonic or posttonic syllable, and nothing is said concerning the nature of the initial consonant of the syllable preceding the cluster with the liquid.) The restrictions

mentioned in Grammont (pages 340-49) are the same as those attached to Rules 2 and 3 (see § 2.5). Grammont, however, established a chronology for the occurrence of metathesis and proposed that metathesis occurs earlier in the case of an initial unstressed syllable than in the case of an initial stressed syllable. Thus, in the following examples:

	Lat.		Gasc.		
35.	cŏŏp(e)rīre	>	cubrí	> *crubí	> curbi 'to cover'
36.	cápra	>	cábra		> crábo 'goat'

the initial syllable is unstressed in (35), and thus is weak by nature. In (36), the initial syllable is stressed and thus is strong by nature. According to Grammont (page 340), the permutation of /r/ takes place earlier in the case of a weak initial syllable. Thus metathesis occurs in example 35 earlier than in example 36. Furthermore, according to Grammont (page 341), in the case of an unstressed syllable, the newly derived segments Liquid + Vowel (i.e., *ru in (35)) undergo an interversion (a permutation of two contiguous segments). Recall that in Rule 3 (see § 2.5), a liquid moves from an explosive position to an implosive position in an initial unstressed syllable, thus in example 25, *pratína > pardvo. The interversion rule results in the following derivation for example 35: *crubí > curbí (where /r/ does not remain in an explosive position, but moves to an implosive position (i.e., *ru > ur)). In example 36, no interversion takes place (i.e., ra > *ar), even though ra is in explosive position, because the metathesized cluster (ra) belongs to a stressed syllable (page 342).

2.5.3 Discussion of Grammont's (1933) rules

Grammont's attempt (Rule 6) to date the occurrence of metathesis appears problematic since no evidence exists to suggest that metathesis occurs earlier in any particular environment. Furthermore, from a phonological point of view, it can be argued that a liquid will be attracted more readily by a stressed syllable rather than by an unstressed syllable.

In a chapter on interversion (pages 239-49), Grammont (1933) explained the following alternate derivations for (37) *Capríolas > Carbyewles ~ Crabyewles ~ Carabyewles 'name of a mountain' as due to the nature of the liquid /r/: "En syllabe inaccentuée on ne sait pas où est passé l'r; il est entouré de la voyelle et en est plein" (page 246). I believe Grammont's statement demonstrates that his interversion rule in example 35 is not a true phonological example of metathesis, but is instead an illustration of the syllabicity of /r/ in Gascon (see my example for Old French /r/ in § 1.2). That speakers did not know where the liquid /r/ belonged in the syllable is exemplified further in an excerpt from a manuscript dated between 1303-1311 where the word esturmen 'instrument' is spelled esturmens and estrumens (Baldinger 1958: 246) (i.e., ur alternates with ru in the same page of the manuscript). Similarly, Rule 3, which Grammont uses as a restriction to Rule 6, also illustrates the syllabicity of /r/. Thus, example 25 in Rule 3 (*pratína > pardyo) is shown to have other synchronic reflexes such as prado and pradario (Cénac-Moncaut 1977: 99). Note that, contrary to Grammont's claim in Rule 3, /r/ in (25) is found in implosive or explosive position in an unaccented syllable.

2.6 Conclusion

Grammont analyzed two types of permutation: one (Type 1) involved a permutation between a consonant and a liquid, the other (Type 2) involved a vowel and a liquid. In the analysis of Type 1 permutations, metathesis occurs when the liquid belongs to an unstressed syllable (Rule 1) or to a stressed syllable (Rule 2). Although Grammont's study of metathesis appears to be very thorough, I believe he merely described the environments in which Type 1 metathesis occurs, rather than explained why it occurs. Type 2 permutation applies only to a limited environment (see restrictions A, B, C, and D to Rule 3 in § 2.5) and has quite a few exceptions (see § 2.5.3). It is my belief that Type 2 permutation is not a true example of phonological metathesis in Gascon.

Grammont limited his analysis to the study of metathesis in the geographical area of Bagnères-de-Luchon. Thus, his data do not take into account many other metathesized words in Gascon. These other words are presented in Chapter Three. Examples involving Type 2 permutations are not included, on the grounds that these words represent a phonetic output resulting from the syllabicity of /r/. Therefore, the data presented in Chapter Three include Type 1 only permutation examples, that is, instances of metathesis involving clusters of a consonant and a liquid.

Notes to Chapter Two

1 Translation (AD). The original (Grammont, page 74) is as follows:
Première formule: UNE LIQUIDE, r OU l, VENANT APRÈS UNE OCCLUSIVE EN SYLLABE POSTTONIQUE, VA SE COMBINER AVEC L'OCCLUSIVE QUI OUVRE LA SYLLABE TONIQUE.

2 The original (Grammont, page 76) is as follows:
Quand la syllabe tonique commence par une voyelle, la liquid va faire diphtongue avec cette voyelle, prenant ainsi la seule place qui soit disponible.

3 The original (Grammont, page 76) is as follows:
Quand la syllabe tonique commence par une voyelle déjà suivie d'une consonne implosive, la place n'étant pas libre, la liquide garde la sienne.

4 The original (Grammont, page 76) is as follows:
Quand la syllabe tonique commence par une continue, la liquide ne peut pas venir se combiner avec elle, parce que la nature même de la continue s'y oppose.

5 The original (Grammont, page 77) is as follows:
Groupe str. Ce groupe ne cède pas son r.

6 The original (Grammont, page 83) is as follows:
Deuxième formule: LIQUIDE COMBINÉE VENANT (immédiatement ou non) APRÈS SYLLABE ATONE (prétonique) VA SE PLACER A LA FIN DE CETTE SYLLABE OÙ ELLE DEVIENT IMPLOSIVE ET FAIT DIPHTONGUE AVEC LA VOYELLE ATONE.

7 The original (Grammont, page 84) is as follows:
Quand la syllabe atone qui précède le groupe occlusive + liquide commence par une voyelle, la liquide ne se déplace pas.

8 The original (Grammont, page 85) is as follows:
S'il y a déjà une consonne implosive dans la syllabe atone, la liquide, trouvant la place prise, fait la seule chose qui lui reste possible: elle va se combiner avec l'occlusive qui ouvre cette syllabe atone.

9 The original (Grammont, page 85) is as follows:
Si la syllabe atone commence par une continue, elle ne peut pas plus attirer la liquide que si elle commence par une voyelle, car une continue ne peut pas se combiner avec une liquide en luchonnais.

10 The original (Grammont, page 86) is as follows:
Troisième formule: LIQUIDE PLACÉE ORIGINAIREMENT EN SYLLABE INITIALE NON TONIQUE RESTE IMPLOSIVE SI ELLE L'A TOUJOURS ÉTÉ, ET SINON LE DEVIENT.

11 The original (Grammont, page 87) is as follows:
Les continues repoussent, autant qu'il leur est possible, le contact de la liquide:
1. La continue est m
2. La continue est s
3. La continue est w
4. La continue est un b qui a été un v à une certaine époque.

12 The original (Grammont, page 89) is as follows:
Quatrième formule: UN GROUPE INTERVOCALIQUE occlusive + nasale DEVIENT nasale + occlusive.

13 The original (Grammont, page 89) is as follows:
Cinquième formule: Cette formule est analogue à la précédente, mais dans le domaine vocalique: UN GROUPE INSOLITE EST REMPLACÉ PAR UN GROUPE ORDINAIRE.

14 The original (Grammont, page 339) is as follows:
UNE CONSONNE COMBINÉE (le plus souvent la liquide r ou l) DANS UNE SYLLABE NON INITIALE VA SE COMBINER AVEC LA CONSONNE QUI OUVRE LA PREMIERE SYLLABE.

CHAPTER THREE

3.0 Introduction

In this chapter, I present the data to be analyzed and the major sound changes reflected in the corpus. I show that a generative analysis of the data fails to offer any type of generalizable explanation for why metathesis occurs in Gascon. An analysis of metathesis in terms of the phonotactic constraints of Gascon also fails to provide a satisfactory explanation for the presence or absence of metathesis in the data. Moreover, no relationship between metathesis and assimilation (the other major historical process present in the data) is established under either analysis.

Rules conceived by sociolinguists do not apply consistently; certain ordered constraints favoring their application must be taken into consideration. I propose an alternative sociolinguistic approach to sound change, based on the system of Bailey (1973). This system involves the use of numerical weights to account for the constraints on rules advocated by sociolinguists. It includes a notation for feature weighting based on a syllable-sensitive approach which I apply in Chapter Four.

3.1 Presentation of the data

Concerning the documentation of the data, a data base for the investigation of metathesis and assimilation in Gascon is gathered from Luchaire (1881), Lespy and Raymond (1887), Grammont (1904), Millardet (1910 and 1918), Ronjat (1932), Schmitt (1934), Baldinger (1962), Bec (1968 and 1970), Rohlfs (1970) and Cénac-Moncaut (1971). For simplification purposes, only one form for each of the words is given in Gascon, rather than all the variant forms provided by the different sources for the data. For example, the word cromba (example 29 in the data) also is spelled croumpa and crumpa in other sources. Variant forms are given when they involve the metathesized clusters of the words in Gascon. Thus, the word courbi also is given here as crubi (example 2 in the data). Variant forms of a word also are given when they reflect two different processes. Thus, in example 17, the Gascon outcome of Latin febrem exemplifies an assimilated form (heure) and a metathesized form (herebe). Finally, the form and date of a word are given as attested by Old Gascon documents wherever possible. For ease of presentation, the data are divided into three different environments in order to show the special conditions placed on the assimilation process discussed in Chapter Four.

A. Environment 1

This environment includes words made up of a medial consonant cluster in intervocalic position. Examples 1 through 18 deal with words that undergo

metathesis; examples 19 through 28 deal are words that undergo assimilation.

Latin		Gascon	
1. cup(e)rāre	(1252: crubar)	crobá	'to collect'
2. cŏŏp(e)rīre	(1510: crobir)	courbí/crubí	'to cover'
3. discŏŏperíre	(1270: descrobie)	descurbí	'to find'
4. páup(ĕ)rem		práube	'poor'
5. bŭcc(ŭ)la		blóca	'mouth'
6.*wíp(ĕ)ra (Gmc.)	> *gwipra	grípo	'viper'
7. púlv(ĕ)rem	> *pubrem	próubo	'powder'
8. cofre (Fr.)		crófe	'coffin'
9. cápra	(1268: craba)	crábo	'goat'
10.*cápreus		crábi	'V-shaped rafter'
11. capreŏlas		crabiéules/carbiéules	'roe-buck'
12. caprícium		crebís	'hut chevron'
13.*caprárium	(1161: crabera)	crabéro	'horned ovine'
14.*caprottāre		crabutá	'to foal a kid'
15.*caprōnem		crabú	'young goat'
16. co(n)fráter		crohérer	'associate'
17. fébrem		héure/herébe	'fever'
18. februārĭu		héure/hérbe	'February'
19. fábrum		háure	'blacksmith'
20. fábrĭca		háurga	'blacksmith'shop'
21. sócra		swéro	'mother-in-law'
22. nĭgra		néra	'black'

23.	cŭ́pru	kúyre	'copper'
24.	patrī́nus	payrí	'godfather'
25.	vĭ́tru	béyre	'glass'
26.	nūtrī́re	neurí	'to nourish'
27.	pŭtrī́re	peurí	'to decay'
28.	arbĭtrā́re	aubirá	'to rule'

B. Environment 2

This environment includes words made up of a medial consonant cluster preceded by a nasal. Examples 29 through 38 involve words that undergo metathesis; examples 39 through 43 are words that undergo neither metathesis nor assimilation.

29:	comparā́re	(1232: crompar)	crombá	'to buy'
30:	cám(ĕ)ra	(1570: crampa)	crámba	'bedroom'
31.	(ex)combrā́re		escrumbá	'to sweep'
32.	ventre (Fr.)		brénte	'belly'
33.	furúnc(ŭ)lu		hlorónc/róungou	'abscess'
34.	temp(ĕ)rā́re		trembá	'to dip'
35.	mĕmŏrā́re		bremba	'to remember'
36.	spī́n(ŭ)la	> *espingla	esplíngo	'needle'
37.	*cáncru		cránc	'sore, ulcer'
38.	tén(ĕ)ru		tréndo	'tender'
39.	gĕ́n(ĕ)ru		jéndre	'son-in-law'
40.	cĭ́ng(ŭ)la		sínclo	'belt'
41.	die-Vénĕris		diéundres	'Friday'

42.	hirŭnd(ŭ)la	hurúnglo	'sparrow'
43.	nŭmĕrósi	numbrúbi	'number'

C. Environment 3

This environment includes words made up of a medial consonant cluster preceded by a sibilant (/s/). Examples 44 through 55 involve words that undergo metathesis; example 56 is a word that undergoes neither metathesis nor assimilation.

44.	căpístru	crabéste	'head'
45.	castrōne	crestón	'castrated lamb'
46.	castrāre	crestá	'to castrate'
47.	castrātum	crestát	'castrated horse'
48.	cástra	cráste	'ditch'
49.	cúsc(ŏ)liu	clósque	'shell'
50.	vésp(ĕ)ras	bréspes	'evening'
51.	vesperāc(ŭ)lu	brespálh	'evening snack'
52.	*vesperizāre	brespeyá	'to taste'
53.	fĕnéstra	hriéste	'window'
54.	pistrīre (1306: prestin)	prestí	'to press'
55.	péss(ŭ)lu	plésc	'to lock'
56.	*mĭsculāre	mesclá	'to mix'

3.2 Data: Historical processes

Before discussing metathesis in Gascon, a list of the major processes affecting the data (using examples from the list in § 3.1) is given below.

(1) Voicing of [p, t, k] in intervocalic position (dated around 400 A.D); for example in (20), [fabrika] > [fabriga].

(2) Spirantization of [b], [g] and [k] before [r] (dated around the end of the 3rd century for [g, k] and during the 4th century for [b]); for example in (17), [febrem] > [feβrem], in (21) [sokra] > [soɣra], and in (22), [nigra] > [niɣra].

(3) Voicing of [p] and [t] before [r] (dated during the 5th century); for example in (23), [kupru] > [kubru] and in (24), [patrinus] > [padrinus].

(4) Spirantization of [b] < [p] and [d] before [r] (dated around the 5th century for [b] and the 6th century for [d]; for example in (23), [kubru] > [kuβru] and in (24), [padrinus] > [paðrinus].

(5) Assimilation of [ð], [ɣ] and [β] in Gascon; for example in (24), [paðrinus] > pavrí, in (22), [niɣra] > néra and in (20), [faβriga] > háurga.

(6) Proparoxytone syncope in the environment of liquids (dated around the end of the 3rd century); for example in (30), cám(ĕ)ra > cámra.

(7) Paroxytone syncope (dated before the end of the 4th century); for example in (29), comparāre > comprāre.

(8) Epenthesis (before the end of the 4th century); for example in (30), cámra > cámbra, in (36), spínla > spíngla, and in (38), ténru > téndru.

(9) palatalization and assimilation of [k] / — [l] in Gascon; for example, in Rohlfs (1970: 151), óc(ŭ)lum > óuelh 'eye.'

3.3 A generative analysis of the data

Except for one alternate Gascon form, in environment 1 (examples 2, 3, and 11), the liquid (/r/ or /l/) moves across syllable boundaries and becomes adjacent to the initial consonant of the preceding syllable; for example in (1), cuprāre > crobá. In Chapter Two (§ 2.5.3), I showed that the different spellings of the Gascon outcome in (2), cŏŏprīre > courbí/crubí, (3), discŏŏprīre > descrobíe/descurbí and (12), capreŏlas > crabiéules/carbiéules (where the derivations are Vowel + Liquid ∼ Liquid + Vowel) illustrate a problem pertaining to syllabic liquids. It is possible to consider all the remaining metathesized words in environment 1 as representing one of the alternate derivations stemming from the syllabicity of liquids. Thus, a change such as in example 1, could be decomposed as cuprāre >*corbá. This would represent a more usual type of metathesis where we have the change Consonant + Liquid > Liquid + Consonant (i.e., br > rb in (1)). Then the phonetic output resulting from the syllabicity of /r/ could be said to yield ro in croba rather than or (*corba). However, these derivations cannot be applied to the words in environments 2 and 3 where, in (28) for example, crombá < *comrbá < comprāre or in (46), cráste < *cásrte < cástra.

In order to form a better generalization about the metathesis process in Gascon, I propose instead that in all three environments, the liquid moves across syllable boundaries and becomes adjacent to the initial consonant of the preceding syllable. In environment 1 (examples 1 through 18), the initial consonant of the syllable preceding the cluster with the liquid is /k/, /p/, /b/, /gw/, or /f/. These consonants share the feature [- coronal].

This is the only feature the consonants have in common, although most of them share the feature [- continuant] except for /f/ ([+ continuant]). For ease of presentation, no restriction is placed on the consonant preceding the liquid. A discussion on the nature of that consonant follows in § 3.3.1. A tentative rule for environment 1 may be formulated as follows in Rule 1.

Rule 1: Metathesis

In a word of at least two syllables, a liquid that is part of a consonant cluster beginning the second syllable moves to the preceding syllable to form a new cluster in that syllable if the initial consonant of that syllable is [- coronal].

The Rule 1 condition is realized in examples 1 through 18 , and metathesis takes place. In examples 19 through 28, assimilation takes place in the case of the intervocalic clusters /br/, /kr/, /gr/, and /tr/ (see § 3.2). Example 23 (cúpru) is the only word where assimilation takes place in the case of a medial cluster /pr/. Why assimilation takes place in (23) will be discussed in Chapter 4.

In examples 17 (fébrĕm) and (18) (februārĭu), both words have an assimilated form (héure) and a metathesized form (herébe, hérbe). The expected form should be the assimilated one , since primary /b/ was spirantized during the 4th century and later assimilated (see § 3.2). This probably means that two developments occurred: one in which /b/ spirantized and one in which it did not. In the nonspirantized form, however, the Rule 1 condition is realized for both words, and metathesis takes place.

In environment 2 (examples 29 through 43), the cluster with the liquid is preceded by a nasal (/m/ or /n/). The presence of the nasal prevents the assimilation process in examples 31, 32, 33, and 37 (see § 3.2). The tentative rule of metathesis for environment 1 (Rule 1), when applied to environment 2, accounts for the derivation of the words in examples 29, 30, 31, 35, 36, and 37. In these words, the initial consonant of the syllable preceding the cluster with the liquid is [- coronal], and metathesis takes place.

Example 40 (*cĭngla > sínclo), where metathesis does not occur, does not present a problem. This is the only case where Latin c = /k/ precedes a high front vowel (i.e., /i/) whereby /k/ > /ts/ > /s/. La Chaussée (1974: 175) indicated that /k/ > /ts/ — /i/ must have taken place around the 3rd century in Vulgar Latin and that the change /ts/ > /s/ took place around the end of the 12th century. To explain the data, it has to be assumed that Latin /k/ + i is at the stage /ts/, and thus has the feature [+ coronal]. In example 43 (*numbrubi), no metathesis occurs because the initial consonant of the syllable preceding the cluster with the liquid is [+ coronal]. In example 41 (*divéndres), however, the initial consonant of the syllable preceding the cluster with the liquid is [- coronal] and no metathesis takes place. In examples 33 (*furúnclu) and 42 (*hirŭndla), /r/ is the initial consonant of the syllable preceding the cluster with the liquid for both words. Metathesis does not take place in (42) because /r/ is [+ coronal], however, metathesis does occur in (33) (furúnclu > hlorónc). Perhaps in (33) metathesis takes place with respect to /f/ ([- coronal] rather than /r/. This would mean, however,

that metathesis does not occur in the case where the syllable precedes the medial cluster and that the liquid moves to the initial syllable of the word. According to Rohlfs (1970: 167), furúnclu already was metathesized in Latin (*flurúncum). The metathesized form may have been introduced in Gascon. This may explain why Modern Gascon has both a metathesized and an assimilated form (roungou).

Examples 34, 38, and 39 cannot be accounted for under the restriction placed on the initial consonant of the syllable preceding the metathesized cluster. In (34) and (38), metathesis takes place although the initial consonant of the syllable preceding the cluster with the liquid is [+ coronal]. In example 39 (*géndru), Latin /g/ > /j/ — /e/ around the end of the 3rd century (La Chaussée, page 175). The initial consonant of the syllable preceding the cluster with the liquid is [- coronal], but metathesis does not take place.

In environment 3 (examples 44 through 56), the cluster with the liquid is preceded by a sibilant (/s/). The presence of /s/ prevents the initial consonant of the clusters /tr/ and /kl/ from being assimilated. As far as the rule for metathesis is concerned, the restriction placed on the initial consonant of the syllable preceding the cluster with the liquid appears to account for the derivation of the words in environment 3. No metathesis, however, occurs in example 56 (*misclāre > mesclá), although /m/ is [- coronal].

3.3.1 Discussion of the metathesis rule

Overall, the [- coronal] restriction placed on the initial consonant of the syllable preceding the cluster with the liquid does not satisfac-

torily account for the derivations exemplified in the data. In examples 39, 41 and 56, metathesis does not take place although the initial consonant is [- coronal]. In examples 34 and 38, metathesis takes place but the initial consonant is [+ coronal]. Grammont's (1904) analysis (see § 2.5), where the initial consonant of the syllable preceding the metathesized cluster must share the feature [- continuant] appears to account for as many words in the data. His [- continuant] restriction, however, does not explain why metathesis takes place in examples 17, 18, 33, and 53 where the initial consonant is [+ continuant]; nor does it explain the absence of metathesis in examples 43 and 56 where the initial consonant is [- continuant].

In medial position, the consonant preceding the liquid presents a problem. In environment 1, the consonant shares only the feature [- coronal]. In environment 2, the consonant in medial position shares only the feature [- continuant]. In environment 3, the consonant shares the feature [- continuant]. It could be that under the Rule 1 condition, the consonant preceding the liquid must be [- coronal] for metathesis to apply in environment 1; in environments 2 and 3, the consonant preceding the liquid must be [- continuant]. However, the absence of metathesis in examples 39, 41, and 56 remains unexplained. In these words, the initial consonant of the syllable preceding the cluster with the liquid is [- coronal], the consonant preceding the liquid is [- continuant], but metathesis does not take place. Overall, under this analysis, the initial consonant of the syllable preceding the cluster with the liquid does not share any specific feature that can explain metathesis in all three environments. The same conclusion applies to the consonant preceding the liquid.

The data could be analyzed another way where we would argue that for all three environments, the nature of the initial consonant of the syllable that precedes the metathesized cluster does not matter. What does matter is that in environment 2 the consonant cluster must be preceded by a nasal, and in environment 3 it must be preceded by /s/. In environment 1, the cluster does not have to be preceded by a nasal or /s/.

It would appear that if any polysyllabic word has a noninitial syllable containing a cluster with a liquid, metathesis takes place in the preceding syllable. Then it remains to determine why metathesis does not occur in example 39, 40, 41, 42, 43, or 56. In (39) (gĕn(ĕ)ru >*jéndru > jéndre), an initial cluster jr is not tolerated by the phonotactics of Gascon. In (40) (*cíngla > sínclo), the affricated ts < /k/ + /i/ could not support a metathesized /l/ because the phonotactics of the language do not permit the initial cluster [tsl]. In (41) (*dievéndris > diéundres), intervocalic /v/ > /β/ in the 2nd century (*diβéndres)(Rohlfs, page 128); and it can be argued that /β/ is not strong enough to support a following metathesized /r/. In (42) (hirúnd(ŭ)la > hurúnglo), metathesis does not take place although, to my knowledge, a medial cluster rl is tolerated in Gascon. In (43) (*numbrósi > numbrúbi) and (56) (*misclāre > mesclá), the phonotactics of the language do not permit an initial cluster mr or ml. In contrast to (56), however, in the case of example 35 (*membrāre > brembá), /m/ > /b/ (Ronjat 1932: 418), and metathesis takes place.

The above analysis presents us with the following problems:

(1) The implication that any polysyllabic word with a medial consonant cluster containing a liquid may undergo metathesis when assimilation does not apply conflicts with the Gascon outcome of the following Latin words found in Grammont (1904: 76, 84) and Rohlfs (1970: 131, 140): (a) aprīle > abrvéw 'April', (b) aprīcu > abríc 'shelter', (c) ūstulat > úscle 'burns', (d) úngŭlam > únglo 'nail,' and (e) umbrārium > umbró 'shade.' These examples do not reveal why (a) and (b), in particular, did not undergo metathesis (i.e., aprīle > *arbyéw, or aprīcu > *arbíc), since the cluster /br/ (</pr/) is in intervocalic position.

(2) Furthermore, these examples seem to imply that a consonant in the initial position of the syllable preceding the cluster with the liquid is a condition for metathesis. This brings us back to our first analysis, with the restriction it placed on the first consonant of words.

In any case, neither analysis proves satisfactory. The use of distinctive features (the first analysis) is not enough to account successfully for the presence or absence of metathesis, nor is the use of phonotactics (the second analysis). Also, no relationship between the assimilation process and the metathesis process has been established in the explanation of the data even though both processes occur for the same consonant clusters.

3.4 A sociolinguistic approach to sound change

Part of the sociolinguistic theory of language change is the belief that rules do not apply necessarily all the time and that ordered constraints

(i.e., factors that promote the operation of a rule) govern their operation. For example, Wolfram and Fasold (1974: 118-20) remarked in their discussion of Labov's (1969) variable rule for English contraction that contraction (the removal of the vowel in _am_, _is_, or _are_ in _I'm here_, _He's writing_, _You're ugly_) applies only if the vowel has a weak accent and is reduced to an [ə] quality sound. Furthermore, "Contraction applies only to auxiliary verbs or forms of _be_ functioning as copulas" (page 118). Wolfram and Fasold proposed an optional rule for contraction as follows in Rule 2.

Rule 2: Variable rule for English contraction

$$\begin{bmatrix} + \text{ nuc} \\ + \text{ cen} \\ - \text{ acc} \end{bmatrix} \longrightarrow (\emptyset) \quad / \quad \#\# \begin{bmatrix} \underline{\quad\quad} \; [- \text{ nuc}] \\ + \text{ TENSE} \end{bmatrix} \quad \#\#$$

The rule is interpreted as follows: A segment with the features [+ nuc] (i.e., a vowel), [+ cen(tral)] (i.e., the [ə] quality), and [- acc] (i.e., a weak accent) sometimes can be deleted (i.e., $\emptyset$) if it is the first sound in the word (i.e., ## —) and is followed by only one consonant (i.e., [- nuc]) which is followed immediately by another external word boundary (i.e., —##). Also, the word must have the grammatical feature + TENSE (to indicate past or nonpast).

Wolfram and Fasold explained that since contraction is a variable rule, it does not operate in all cases but that some factors can favor the application of the rule. Thus, they mention three constraints affecting the contraction rule:

(1) The rule is favored if a verb follows. For example, in John is going contraction is more likely to occur than in John is good.

(2) The rule is favored if the subject ends in a vowel. For example, Joe is going is favored over John is going.

(3) The rule is favored if what follows, if not a verb, is a noun phrase. For example, John is a man is favored over John is good or John is in Chicago.

The following table is given by Wolfram and Fasold (page 119):

ENVIRONMENT			EXAMPLE	PERCENT DELETED
Preceding vowel	Following verb	Following noun phrase	(Not possible)	---
Preceding vowel	Following verb	No following noun phrase	Joe is going.	86
Preceding vowel	No following verb	Following noun phrase	The play is a musical.	80
Preceding vowel	No following verb	No following noun phrase	The tree is in the yard.	70
Preceding consonant	Following verb	Following noun phrase	(Not possible)	---
Preceding consonant	Following verb	No following noun phrase	The men are going.	65
Preceding consonant	No following verb	Following noun phrase	The women are leaders.	37
Preceding consonant	No following verb	No following noun phrase	The children are fine.	25

Table 1

Ranking of three linguistic factors favoring contraction

It is to be understood from Table 1 that some factors are mutually exclusive: If a verb follows the copula, there cannot also be a noun phrase. The converse also is true: If a noun phrase follows the copula, there cannot be a verb. The contraction should read: In an example such as Joe is going (where a vowel precedes the copula and a verb follows it) deletion occurs 86 percent of the time. In an example such as The play is a musical (where a vowel precedes the copula and a noun phrase follows it) deletion occurs 80 percent of the time.

Wolfram and Fasold (page 120) concluded that within the ... constraints favoring the application of the contraction rule, "a preceding vowel is the first-ordered constraint, a following verb is the second-ordered constraint, and the presence of a following noun is the third-ordered constraint." They formalized the variable rule (Rule 2) as follows in Rule 3 to represent the three constraints:

Rule 3:

$$\begin{bmatrix} +\text{ nuc} \\ +\text{ cen} \\ -\text{ acc} \end{bmatrix} \longrightarrow (\emptyset) \;/\; A\,(\,[+\text{ nuc}]\,)\;\#\#\; \begin{bmatrix} \underline{\quad\quad} & [-\text{ nuc}] \\ +\text{ TENSE} & \end{bmatrix} \;\#\#\; \begin{matrix} B\,([+\text{ VERB}]) \\ \cap(\text{NP}) \end{matrix}$$

On the left of the first external word boundary (##), A ([+ nuc]) represents the first-order constraint and means that the rule is favored most if the word which precedes the copula ends in a vowel.

On the right of the second external word boundary, B ([+ VERB]) represents the second-order constraint and means that the rule also is favored if what follows is a verb. Finally, ⌜(NP), which is the third-order constraint, means that in the absence of the second-order constraint the rule is favored if what follows is a noun phrase.

Let us reformulate Rule 3 according to Bailey's (1973) system where letters are replaced by numbers. Bailey stated that "rules operate faster in heavier environments than in lighter ones" (1973: 45). Therefore, the first-order constraint, the heaviest environment in (2), would be given a weight of 3. The second-order constraint, a lighter environment, would receive a weight of 2. The third-order constraint, the lightest environment, would be given a weight of 1. The variable rule now can be written according to Bailey's system as follows in Rule 4:

Rule 4:

$$\begin{bmatrix} +\text{ nuc} \\ +\text{ cen} \\ -\text{ acc} \end{bmatrix} \longrightarrow (\emptyset) \;/\; \underset{3\ ([+\text{ nuc}])}{\#} \begin{bmatrix} \underline{\quad} & [-\text{ nuc}] \\ +\text{ TENSE} & \end{bmatrix} \underset{1\ (NP)}{\#}{}^{2\ (+\text{ VERB})}$$

Table 1 is rewritten according to Bailey's system as follows in Table 2:

ENVIRONMENT					
VOWEL	VERB	NOUN	TOTAL WEIGHT OF ENVIRONMENT	EXAMPLE	PERCENT DELETED
3 (- nuc)	2 (verb)	1 (NP)			
3	2	-1	4	Joe is going.	86
3	-2	1	2	The play is a musical.	80
3	-2	-1	0	The tree is in the yard.	70
-3	2	-1	-2	The men are going.	65
-3	-2	1	-4	The women are leaders.	37
-3	-2	-1	-6	The children are fine.	25

Table 2

Conversion of Table 1 into Bailey's weighting system

As can be seen from Table 2, a constraint is given a positive value when it is part of the environment and a negative value when it is not. The highest positive totals represent the tendency for deletion.

Another notational method used by Bailey is the "implicational feature coefficient" which applies to two symbols under his ternary feature notation: (⊃Fi) and (⊂Fi). (⊃Fi) indicates that the positive value of a feature ((+Fi)) takes precedence in the rule over the mid value ((xFi)), and that the mid value takes precedence over the negative value ((- Fi)). The opposite symbol ((⊂Fi)) indicates the reverse; that is, the negative value precedes the mid value and the mid value precedes the positive value. [1]

A discussion of Machonis's (1982) analysis of the preconsonantal spirantization process from Vulgar Latin to Gallo-Roman serves as an illustration of the use of the implicational feature coefficient.

3.5 Preconsonantal spirantization process from Vulgar Latin to Gallo-Roman

The preconsonantal spirantization process began with [g] and [k] around the end of the 3rd or beginning of the 4th century (e.g., [lakrima] > [laχrima] and [flagrat] > [flaɣrat]. In the environment of [r], the spirantization of [b] took place during the 4th century (e.g., [labra] > [laβra]. [b] < [p] spirantized during the 5th century (e.g., [kabra] < capra > [kaβra]. [d] spirantized before [r] at the end of the 6th century (e.g., [padre] > [paðre]). [p], [t], and [k] spirantized before other consonants during the 7th century (e.g., [ropta] > [roθta], [platnu] > [plaθnu], and [advenire] > [aðvenire]).

In order to represent the order in which preconsonantal spiran-

tization took place, Machonis (page 53) proposed a variable rule as follows: [2]

Rule 5: Variable rule for preconsonantal spirantization

$$\begin{bmatrix} C \\ \supset \text{Grave} \\ \supset \text{Lingual} \\ \supset \text{Voiced} \end{bmatrix} \longrightarrow ([+\ \text{Continuant}]) \ / \ \text{—} \ C$$

In Rule 5, [⊃Grave] represents the heaviest implicational feature or the first-order constraint. [⊃Lingual] represents the second-order constraint. [⊃Voiced], the lightest feature, represents the third-order constraint. Machonis (page 15) proposed a hypothetical strength scale to indicate the order in which the stops spirantize: [3]

Consonant	⊃Grave	⊃Lingual	⊃Voiced	Total
[p]	x = 0	- = -2	x = 0	-2
[t]	- = -3	x = 0	x = 0	-3
[k]	x = 0	+ = +2	x = 0	+2
[b]	x = 0	- = -2	+ = +1	-1
[d]	- = -3	x = 0	+ = +1	-2
[g]	x = 0	+ = +2	+ = +1	+3

Table 3

Hypothetical strength scale for input favoring spirantization

[p], [k], [b], and [g] are [x Grave] in Bailey's system and receive a

value of zero. [t] and [d], which are [- Grave], receive a value of -3 since [⊃Grave], which represents the first-order constraint, is the heaviest of the three features. [k] and [g], which are [+ Lingual], are valued at +2 since [⊃ Lingual] represents the second-order constraint. [p] and [b], which are [- Lingual], receive a negative weight of -2. [t] and [d], which are [x Lingual], are given a weight of zero. Finally, [b], [d], and [g], which are [+ Voiced], are valued at +1 since [⊃ Voiced] represents the third-order constraint. [p, t, k], which are [x Voiced] in Bailey's system, receive a weight of zero. Machonis' calculations show that [g] and [k], which represent the heaviest weighted stops with a hypothetical weight of +3 and +2, spirantize first, followed by [b] (+1), [p] and [d] (-2), and [t] (-3).

Machonis also notes that preconsonantal spirantization is favored when the stop is followed by [r]. For example, [kwadratu] > [kwaðratu] in the 6th century while [advenire] > [aðvenire] in the 7th century. Accordingly, Machonis proposes the reformulation of his preconsonantal spirantization rule (Rule 5) as follows in Rule 6:

Rule 6:

$$\begin{bmatrix} C \\ \supset \text{Grave} \\ \supset \text{Lingual} \\ \supset \text{Voiced} \end{bmatrix} \longrightarrow ([+\text{Continuant}]) \;/\; \underline{\quad} \begin{matrix} C \\ [\supset \text{Vibrant}] \end{matrix}$$

Table 4 represents Machonis' hypothetical strength scale for the environment favoring preconsonantal spirantization:

Environment	Vibrant	Total
/ —— r	x = 0	0
/ ——C (C ≠ [r])	- = -1	-1

Table 4

Hypothetical strength scale for environment favoring preconsonantal spirantization

Calculations of input and environment weight such as those in Tables 3 and 4 are adapted in a method of weighting syllables which produces my rule-account of metathesis in Gascon (see Chapter Four).

3.6 Conclusion

It was demonstrated in § 3.3 that the use of distinctive features under generative phonology does not account successfully for the metathesis process in Gascon. The analysis in terms of the phonotactics of the language also failed to explain the data satisfactorily. At one point in the phonology of Gascon, some medial clusters with a liquid were not permitted. As a result, assimilation or metathesis occurred in these clusters. Since the assimilation process must have occurred before metathesis, we need to discover why assimilation occurs for some words in the Gascon data and metathesis occurs for others. The study of assimilation and how it relates to the metathesis process is presented in Chapter Four. Because sociolinguistic theory emphasizes the presence of constraints that can vary through time and processes, our analysis of assimilation and metathesis will be based on the method illustrated in § 3.4.

Notes to Chapter Three

[1] Bailey (1973) did not explain why he used a ternary feature notation but referred to the problem of marking mid vowels in a binary feature system. Also, Bailey's use of ternary features is consistent with views expressed by Weinreich, Labov, and Herzog (1968). According to the latter, binary features do not show the progression of sound changes since they do not take the articulatory progression of changes into account.

[2] See Appendix B for a description of Bailey's (1973) ternary-valued features.

[3] In Bailey's system (1973: 125), the mid value of a feature receives a weight of zero.

CHAPTER FOUR

4.0 Introduction

In this chapter, Bailey's (1973) distinctive feature notation is adopted and employed in the analysis of assimilation and metathesis in Gascon. I first show that the constraints favoring the assimilation process were reordered at one point in the language. This reordering is accounted for by applying Bailey's numerical weight approach (see § 3.5). I then illustrate how the reordering of constraints prevented assimilation from being a continuing productive process in Gascon. This supports my general hypothesis that when assimilation no longer applies, metathesis arises as a viable alternative. I propose that the difference in weight between two contiguous syllables can explain the attraction of a liquid across syllable boundaries to a heavier syllable. The method I propose for weighing syllables successfully explains metathesis and can predict its occurrence in Gascon.

4.1 First spirantization process

As can be seen in the data (examples 18 to 23 in § 3.1 (A)), /b/, /k/, and /g/ spirantized before /r/. However, the spirantization process was ordered (cf., § 3.5): /g/ and /k/ spirantized first, and /b/ last. Machonis' variable rule (discussed as Rule 6 in § 3.5) can be used for the spirantization of /g/, /k/, and /b/. For ease of presentation, the rule is repeated here as Rule 1:

Rule 1: First spirantization process rule

$$C \longrightarrow ([+\text{ Continuant}]) \;/\; \underline{\quad} \; C$$

$$\begin{bmatrix} \supset \text{ Grave} \\ \supset \text{ Lingual} \\ \supset \text{Voiced} \end{bmatrix} \qquad [\supset \text{Vibrant}]$$

Recall that the implicational feature [⊃Grave] represents the first-order constraint and means that the application of the rule is favored in the case of a consonant which is [+ Grave], [x Grave], or [- Grave], in that order. [⊃Lingual] represents the second-order constraint, [⊃Voiced] represents the third-order constraint. C [⊃Vibrant] means that the stops are spirantized in the environment of /r/. Table 1 represents the constraints placed on the application of Rule 1 for /k/, /g/, and /b/.

Consonant	⊃Grave	⊃Lingual	⊃Voiced	Total weight
/k/	(x) 0	(+) 2	(x) 0	2
/g/	(x) 0	(+) 2	(+) 1	3
/b/	(x) 0	(-) -2	(+) 1	-1

Table 1: Hypothetical weights for first spirantization

Recall that /k/, /g/, and /b/ are [x Grave] in Bailey's system and receive a weight of zero. /k,g/ are [+ Lingual] and receive a weight of 2. /b/, which is [- Lingual], is given a weight of -2. /k/, which is [x Voiced], has a weight of zero. /b, g/, which are [+ Voiced], are given a weight of 1. The total weight of each segment shows that /g/, which is weighted most heavily with a weight of 3, spirantizes first; then /k/ with a weight of 2; and finally /b/, the least weighted segment, spirantizes last with a weight of -1.

4.2 Second spirantization process

As mentioned in § 3.5, the voicing of voiceless stops in intervocalic position, dated around the beginning of the 4th century, generalized to bilabial and alveodental stops before /r/ (cf., examples 1 to 16 and 23 to 28 in § 3.1 (A)). When the voicing process of /p/ took place, the first spirantization process still was productive. Thus, both primary and secondary /b/ underwent spirantization before /r/. /d/ spirantized before /r/ around the 6th century (cf., examples 24 to 28 in § 3.1 (A)). However, La Chaussée (1974: 183) indicated that while the voicing process

spread to many Gallo-Roman dialects, the spirantization process appears to have been limited to Northern Gaul. This appears to be true of Gascon as well, where the second spirantization of /b/ < /p/ seems to have been limited to the environment of /r/ followed by /u/. For example (in § 3.1 (A)), (23) cupru > *cubru > *cuβru > kuvre, but (10) capra > *cabra > craba.

Because /d/ spirantized in Gascon but secondary /b/ did not (except in the environment of /r/ followed by /u/), I propose the following rule (Rule 2) to represent the reordering of the constraints placed on the stops undergoing the second spirantization process.

Rule 2: Second spirantization process rule

$$C \longrightarrow ([+\text{ Continuant}]) \;/\; \text{—} \; C$$

$$\begin{bmatrix} \supset \text{Lingual} \\ \supset \text{Grave} \\ \supset \text{Voiced} \end{bmatrix} \qquad [\supset \text{Vibrant}]$$

Rule 2 indicates that spirantization is favored in the case of a segment (i.e., /d/) that has the implicational feature [⊃Lingual] as its first-order constraint, followed by the feature [⊃Grave], and finally by the feature [⊃Voiced]. Table 2 represents the hypothetical strength scale favoring the second spirantization process.

Consonant	⊃ Lingual	⊃ Grave	⊃ Voiced	Total weight
/b/	(-) -3	(x) 0	(+) 1	-2
/d/	(x) 0	(-) -2	(+) 1	-1

Table 2: Hypothetical weight for second spirantization

/b/, which is [- Lingual], receives a weight of -3 and /d/, which is [x Lingual], a weight of zero. /b/ is [x Grave] and receives a weight of zero while /d/ ([- Grave]) has a weight of -2. Both consonants are [+ Voiced] and receive a weight of 1. It is to be noted that /b/ has a -3 [Lingual] value in Table 2 while it has a -2 [Lingual] value in Table 1. This is because in the hypothetical strength scale for spirantization in Table 2, [⊃Lingual] now is in the first-order position. Since there has been a reordering in the hierarchy of features favoring the rule, /d/ now has the features favoring spirantization while /b/ no longer has the favored weight for spirantization.

4.2.1 Spirantization of /b/ before /u/

As mentioned in § 4.2, the spirantization of /b/ < /p/ in Gascon took place only when /r/ was followed by /u/. The following environment rule (Rule 3) is proposed to represent the spirantization of /b/.

Rule 3: Spirantization of /b/

$$/b/ \longrightarrow ([+\ \text{Continuant}])\ /\ -\quad \begin{matrix} C \\ [\supset \text{Vibrant}] \end{matrix} \quad \begin{matrix} V \\ \left[\begin{matrix} \supset \text{Round} \\ \supset \text{Grave} \end{matrix}\right] \end{matrix}$$

According to Rule 3, /b/ becomes a spirant in the environment of /r/ followed by /u/ ([⊃Round], [⊃Grave]). The hypothetical strength scale of vowels favoring the spirantization of /b/ is devised in Table 3.

Environment	⊃ Round		⊃ Grave		Total weight
- /i/	(-)	-2	(-)	-1	-3
- /e/	(-)	-2	(-)	-1	-3
- /a/	(-)	-2	(x)	0	-2
- /o/	(x)	0	(+)	1	1
- /u/	(+)	2	(+)	1	3

Table 3: Hypothetical weight of vowels for second spirantization

/i, e, a/ are [- Round] and are given a weight of -2. /o/ is [x Round] and has a weight of zero. /u/ is [+ Round] and has a weight of 2. /i/ and /e/ are [- Grave] and receive a weight of -1. /a/ is [x Grave] and has a weight of zero. /o/ and /u/ are [+ Grave] and receive a weight of 1. /u/ represents the heaviest weighted segment with a weight of 3. Since /b/ in Gascon spirantized only in the environment of /u/, we can infer that the minimum environment weight for spirantization of /b/ was 3, and that in all other environment weights the clusters of /b/ + /r/ did not spirantize but instead underwent metathesis.

4.3 Discussion of assimilation

In the presentation of the diachronic processes in Gascon thus

far, the treatment of a medial consonant cluster formed by a Stop + /r/ has exemplified the following changes:

(1) Near the end of the 3rd century and throughout the 4th century, the initial consonants of the medial Latin clusters /gr, kr, br/ were spirantized (in the order described in § 4.1) and later assimilated.

(2) Toward the beginning of the 5th century, the initial consonants of the medial Latin clusters /pr/ and /tr/ were voiced.

(3) Around the end of the 6th century, the initial consonant of the voiced cluster /dr/ spirantized and later was assimilated; but the (newly) voiced consonant of the cluster /br/ was not assimilated except in the specific environment of /u/ following the cluster.

The first spirantization process, the voicing process, and the second spirantization process can be explained in terms of the phonotactics of the language: in a medial cluster of a Stop + /r/, Gascon favors the assimilation of the stop.

In the first stage leading to assimilation, primary /g/, /k/, and /b/ were spirantized. Thus, stops which were [⊃Grave] favored the process of assimilation most. Then, in a second stage leading to assimilation, /d/ was spirantized and later assimilated but secondary /b/ was not assimilated. This means that during that period in the development of Gascon, a [⊃Lingual] stop favored assimilation most. Therefore I propose that, in terms of factors favoring assimilation at the time of the second spirantization process, the first-order constraint requires that the initial stop of the medial cluster with /r/ be [⊃Lingual]. The second-order constraint favoring assimilation is that the initial

consonant of the cluster be [⊃Voiced] since /tr/ → /dr/ and /pr/ → /br/. The third-order constraint is that the initial consonant of the cluster be [⊃ Continuant] (as exemplified by the second spirantization process leading to assimilation). I can now propose a rule (Rule 4) and a hypothetical strength scale for assimilation (as given in Table 4).

Rule 4: Assimilation

$$C \longrightarrow \emptyset \;/\; \underline{\quad} \; C$$

$$\begin{bmatrix} \supset \text{Lingual} \\ \supset \text{Voiced} \\ \supset \text{Continuant} \end{bmatrix} \qquad [\supset \text{Vibrant}]$$

Consonant	⊃ Lingual	⊃ Voiced	⊃ Continuant	Total weight
/b/	(-) -3	(+) 2	(-) -1	-2
/d/ > /ð/	(x) 0	(+) 2	(+) 1	3

Table 4: Hypothetical weights for assimilation

4.4 Discussion of metathesis

In § 4.3 it was shown that a reordering in the hierarchy of constraints favoring assimilation led to a limitation of the assimilation process in Gascon. This can explain why in environment 1 (§ 3.1 (A)), assimilation does not occur in examples 1 through 16 with respect to secondary /b/. Since assimilation applies only to secondary /b/ in the envi-

ronment of /u/, I suggest that metathesis is a separate phonological process which arises as an alternative to assimilation in environment 1. We also must account for the fact that metathesis occurs in environments 2 and 3 (§ 3.1 (B) and (C)) where assimilation is prevented. Moreover, we need to explain why metathesis does not occur for some words in environments 2 and 3. Finally, the fact that metathesis occurs in environment 1 (i.e., in intervocalic position) rather than some other sound change (such as vowel epenthesis in Modern Gascon capirou < capreolum (Rohlfs 1970: 169)) must be accounted for. I propose that the weight of the syllable preceding a cluster of a Stop + Liquid can explain the metathesis process. My method for weighing syllables takes the following factors into account:

(1) which initial consonants of the syllables preceding the Stop + Liquid clusters are involved in the metathesis process (In § 3.3.1 it was demonstrated that a consonant must be in word initial position as a condition for metathesis)

(2) which consonants precede the liquids /r/ and /l/ in environments 1, 2, and 3

(3) which medial consonants are involved in environments 2 and 3 when the clusters are not in intervocalic position

(4) whether or not the metathesized clusters are preceded or followed by specific vowels

I will use these four factors to assign hypothetical weights to each consonant and vowel according to the role each plays, after which the weights will be added up to build total syllable units. I apply this method to each word in the data and show that metathesis results whenever a preceding syllable is heavier than an adjacent one.

4.4.1 Discussion of metathesis in environment 1

The words which remain to be analyzed are listed below. Each Latin form of the word is given under its intermediate stage as discussed in § 3.2.

	Latin	Gascon	
1.	cubrā́re	crobá	'to collect'
2.	cŏŏbrí́re	courbí	'to cover'
3.	discŏŏbrī́re	descurbí	'to find'
4.	páubrem	práube	'poor'
5.	búccla	blóca	'mouth'
6.	wípra (Gmc.)	grípo	'viper'
7.	púlvrem	próubo	'powder'
8.	cofre (Fr.)	crófe	'coffin'
9.	cábra	crábo	'goat'
10.	cábreus	crábi	'V-shaped rafter'
11.	cabrĕŏ́las	carbiéules	'roe-buck'
12.	cabrícium	crebís	'hut chavron'
13.	cabráriam	crabéro	'horned ovine'
14.	cabrottā́re	crabutá	'to foal a kid'
15.	cabrṓnem	crabú	'young goat'
16.	co(n)frá́ter	crohérer	'associate'
17.	fĕ́brem	héure/herébe	'fever'
18.	februā́rĭu	héure/hérbe	'February'

In example 5 (búccla [bukkla]), /kk/ is a geminate and the first /k/ is not palatalized and assimilated to the adjacent /l/ (cf., § 3.2). In example 6 (wípra), Germanic /w/ becomes /gw/ and finally /g/ (La Chaussée 1974: 97). In example 7 (púlvrem), the following changes can be inferred: púlvrem > púlbrem > póubrem (where /l/ is vocalized before the cluster /br/. In example 11 (cabréolas), the accent moved from the ante-penultimate syllable to the penultimate syllable in Vulgar Latin (cabréolas) (La Chaussée, page 163). Example 16 (co(n)frater) presents a problem. According to Fouché (1961: 800), /nf/ became /f/ in Vulgar Latin. The cluster /nf/ then was reintroduced in Latin in the case of compound words or words which were considered compound (Ronjat 1932: 211). In Luchaire 's (1881) list of Old Gascon words, the following forms (dating from 1269) are given: cofraire (page 147) and confrairia (page 149). Because /n/ is assimilated to the adjacent /f/ in other Gascon words, the cluster /fr/ is considered in intervocalic position in the analysis of the data.

In environment 1, the initial consonant of the syllable preceding the metathesized cluster is /k/, /p/, /b/, /gw/ , or /f/. These consonants are the same (with the addition of /t/) for all the examples undergoing metathesis in environments 2 and 3 (§. 3.1 (B) and (C)). In all three environments, the consonant /k/ seems to favor metathesis most and therefore must have a feature make-up conducive to the metathesis process. Moreover, most of these features are shared by the other consonants (see Appendix C). The features appear to observe the preferential order: [⊂ Coronal], [⊂ Continuant], [⊃ Lingual]. This means that the first-

order constraint is [⊂Coronal], the second-order constraint is [⊂Continuant], and the third-order constraint is [⊂Lingual]. A hypothetical strength scale for the consonants in initial position in environment 1 is proposed in Table 5.

Consonant	⊂ Coronal	⊂ Continuant	⊃ Lingual	Total weight
/p/	(-) 3	(-) 2	(-) -1	4
/b/	(-) 3	(-) 2	(-) -1	4
/k/	(-) 3	(-) 2	(+) 1	6
/gw/	(-) 3	(-) 2	(+) 1	6
/f/	(-) 3	(+) -2	(-) -1	0

Table 5: Relative weight of consonants in initial position

In Table 5, all consonants with the feature [- Coronal] or [- Continuant] receive a positive value. This is because, according to Bailey's system, "In calculating environment weighting, minus weights give positive products when multiplied with minus coefficients, and negative products when multiplied with plus feature values" (page 45). Thus, if a rule is favored by the feature [⊂ Continuant], /p/ ([- Continuant]) receives a positive value: - X - = +. /p/, /b/, /k/, and /gw/ are [- Continuant] and receive a value of +2 (second-order constraint in Table 5), while /f/ ([+ Continuant]) receives a value of -2.

In medial position in environment 1, the consonant preceding the liquid (/r/ or /l/) is /b/, /p/, /f/ , or/k/. In environment 2 (§ 3.1 (B)), the consonant preceding the liquid is /b/, /p/, /k/, /g/, or /d/.

In environment 3 (§ 3.1 (C)), the consonant preceding the liquid is /t/, /p/, or /k/. In all three environments, the consonants that precede the liquids are those that also were assimilated at one point in Gascon. Although assimilation and metathesis are different processes, they appear to serve the same function in the language; both processes occur because Gascon does not allow a medial Consonant + Liquid cluster. The strength scale for assimilation (Table 4) will be used in the analysis of metathesis in order to establish how the role played by the consonants preceding the liquids in the assimilation process relates to the metathesis process. The relative weight of the consonants in medial position in environment 1 is given in Table 6.

Consonant	⊃ Lingual	⊃ Voiced	⊃ Continuant	Total weight
/b/	(-) -3	(+) 2	(-) -1	-2
/p/	(-) -3	(x) 0	(-) -1	-4
/k/	(+) 3	(x) 0	(-) -1	2
/f/	(-) -3	(x) 0	(+) 1	-2

Table 6: Relative weight of consonants in medial position

As far as vowels are concerned, no particular vowel seems to favor metathesis in any of the three environments. For some words, metathesis takes place when the syllable preceding the consonant cluster with the liquid is stressed; for others, metathesis occurs when the cluster with the liquid belongs to a stressed syllable. However, our calculation must take into account the fact that vowels are strongest in stressed syllables (La Chaussée 1974: 21-22). Therefore, vowels will be considered only in terms of whether or not they are accented. They are weighed accordingly in Tables 7 and 8.

Vowel	⊃ Nuclear	Total weight
/i/	(+) 1	1
/e/	(+) 1	1
/a/	(+) 1	1
/o/	(+) 1	1
/u/	(+) 1	1

Table 7: Input weight for unaccented vowels

Vowel	⊃ Nuclear	⊃ Accent	Total weight
/i/	(+) 2	(+) 1	3
/e/	(+) 2	(+) 1	3
/a/	(+) 2	(+) 1	3
/o/	(+) 2	(+) 1	3
/u/	(+) 2	(+) 1	3

Table 8: Environment weight for unaccented vowels

In Table 7, the vowels are weighted in reference to the feature [⊃ Nuclear] for the following reasons:

(1) [⊃ Nuclear] represents the syllabic peak. Such a feature must be used since our analysis depends on the total weight of a given syllable in contrast to the total weight of an adjacent syllable.

(2) [⊃ Nuclear] is the only necessary feature for vowels since the features [⊃ Low] and [⊃ Back] are not relevant to the analysis. [⊃ Nuclear] is the only constraint in Table 7; accordingly, all vowels have the same input weight (1).

In Table 8, although the feature [⊃ Accent] has to be accounted for, the feature [⊃ Nuclear] is preferred over [⊃ Accent] for the following reasons:

(1) Millardet (1920: 151) showed that the presence or absence of a stressed vowel has little impact on metathesis in Gascon.

(2) [⊃ Nuclear] precedes [⊃ Accent] in Bailey's hierarchical listing of the relative weighting of features (1973: 124). The first-order constraint in Table 8 is [⊃ Nuclear] and the second-order constraint

is [⊃Accent]. Accordingly, all accented vowels share the same environment weight (3).

The assimilation process occurs intervocalically when the stops /k/, /g/, /b/ and /d/ precede /r/ (see examples 19 through 28 in § 3.1 (A)). /k/ is palatalized and assimilated when it precedes /l/ (see § 3.2). Metathesis also occurs with both /r/ and /l/ (see examples 1 through 18 in environment 1). Therefore, /r/ and /l/ must share specific features favoring the two processes. These features are by preferential order: [⊃Vibrant], [⊃Liquid], and [⊃Continuant]. A strength scale for /r/ and /l/ is proposed in Table 9.

Consonant	⊃Vibrant	⊃Liquid	⊃Continuant	Total weight
/r/	(x) 0	(x) 0	(x) 0	0
/l/	(-) -3	(+) 2	(+) 1	0

Table 9: Relative weights for /r/ and /l/

In Table 9, it should be noted that the feature [⊃Vibrant] is given preference over the feature [⊃Liquid]. This is because Bailey (page 112) used the feature [Liquid] not only for /r/ and /l/ but also for /s/ and /z/. Therefore, [Vibrant] is the only feature that differentiates /r/ from the other liquid consonants.

A calculation of the weights of the first and second syllables for environment 1 now is proposed in Table 10. The weights of each segment forming the first syllable (the syllable preceding the cluster with the liquid) are added together and compared to the total weight of the second syllable (the syllable comprised of the Consonant + Liquid cluster). It is demonstrated that for all examples, each time the preceding syllable is heavier in its total weight than the adjacent syllable,

metathesis takes place.

Corpus	First syllable	Second syllable	Total weight	Gascon forms
1. cubrā́re	6 + 1	-2 + 0 + 3	7 $ 1	crobá
2. coobrī́re	6 + 1	-2 + 0 + 3	7 $ 1	courbí
3. discŏŏbrí́re	$6 + 1	-2 + 0 + 3	7 $ 1	descourbí
4. páubrem	4 + 3	-2 + 0 + 1	7 $ -1	práube
5. búccla	4 + 3	2 + 0 + 1	7 $ 3	blóca
6. gwípra	6 + 3	-4 + 0 + 1	9 $ -3	grípo
7. púbrem	4 + 3	-2 + 0 + 1	7 $ -1	próubo
8. cofre	6 + 3	-2 + 0 + 1	9 $ -1	crófe
9. cábra	6 + 3	-2 + 0 + 1	9 $ -1	crábo
10. cábreus	6 + 3	-2 + 0 + 1	9 $ -1	crábi
11. cabrĕ́ólas	6 + 1	-2 + 0 + 1	7 $ -1	carbiéules
12. cabrícium	6 + 1	-2 + 0 + 3	7 $ 1	crebís
13. cabráriam	6 + 1	-2 + 0 + 3	7 $ 1	crabéro
14. cabrottā́re	6 + 1	-2 + 0 + 1	7 $ -1	crabutá
15. cabrṓnem	6 + 1	-2 + 0 + 3	7 $ 1	crabú
16. cofráter	6 + 1	-2 + 0 + 3	7 $ 1	crohérer

Table 10: Calculation of the weights of first and second syllables in environment 1

Two words in environment 1 have not yet been accounted for in our analysis: example 17, fébrĕm > héure/hérbe 'fever' and example

18, febr(ŭ)ā́rĭu > héure /herébe 'February.' Recall that the expected form is the assimilated one (héure) , since primary /b/ was spirantized during the first spirantization process and later assimilated (see §3.3 for a discussion of these two words). In the nonspirantized form, primary /b/ underwent the same development as secondary /b/, that is, the cluster /br/ was metathesized in Gascon (hérbe / herébe). A calculation of the weights of the syllables in fébrĕm and febr(ŭ)ā́rĭu is given in Table 11. It should be noted that in (18) (febr(ŭ)ā́riu), unaccented u = /w/ disappeared in Vulgar Latin (Ronjat (page 245)). Tables 5, 6 and 9 are used in the calculation of the hypothetical weights for /f/, /b/ and /r/. Tables 7 and 8 are used in the calculation of the hypothetical weights for the vowels.

	First syllable	Second syllable	Total weight
17. fébrĕm	0 + 3	-2 + 0 + 1	0 $ -1
18. febrā́rĭu	0 + 1	-2 + 0 + 3	1 $ 1

Table 11: Calculation of the weights of the first and second syllables in fébrĕm and febrā́rĭu

In example 17, the first syllable is heavier and metathesis occurs. In example 18, the first syllable has the same weight as the second but metathesis takes place for the learned form of the word (herébe). It may be that the word already was metathesized in Vulgar Latin (i.e., *frebā́rĭum (Rohlfs (page 147)) or that the metathesized form of the word was borrowed from another language (i.e., febrā́rĭu > O.Fr. frevier~freuvier

(Fouché (page 753)).

4.4.2 Discussion of metathesis in environment 2

For ease of presentation, a list of words given in § 3.1 (B) is repeated below. Each Latin form of the word is given under its intermediate stage as discussed in § 3.2.

	Latin	Gascon	
29.	comprā́re	crombá	'to buy'
30.	cámbra	cráamba	'bedroom'
31.	(ex)combrā́re	escrumbá	'to sweep'
32.	bentre (Fr.)	brénte	'belly'
33.	furúnclu	roungóu/hloróonc	'abscess'
34.	tempráre	trembá	'to dip'
35.	membrā́re	bremba	'to remember'
36.	spíngla	espíngo	'needle'
37.	cáncru	cránc	'sore, ulcer'
38.	téndru	tréndo	'tender'
39.	géndru	yéndre	'son-in-law'
40.	cíngla	sínclo	'belt'
41.	divéndris	diéundres	'Friday'
42.	hirúndla	hurúnglo	'sparrow'
43.	numbrósi	numbrúbi	'number'

In example 35 (membrā́re), recall that initial /m/ > /b/ (see § 3.3). In example 36 (spíngla), spíngla > espíngla in Vulgar Latin

(Anglade 1977: 160). In example 41, /v/ > /β/ in the second century (see § 3.3). In example 40, c in cíngla is at the stage /ts/ (see § 3.3). In example 42, the following changes are inferred: hirúndla >*hirúnlla > *hirúnla > hirúnzla (Millardet 1910: 99). The change dl > ll > l took place in Classical Latin (Grandgent 1905: 55). Epenthesis (i.e., nl > ndl) took place before the end of the 3rd century (see § 3.2). Therefore, /g/ will be considered in our analysis of the medial consonants preceding the liquids rather than /d/.

In environment 2, clusters such as /tr/, /gl/, and /kl/ are not assimilated because they are not in intervocalic positions. The initial consonants of the syllables preceding the metathesized clusters are /k/,/t/, /p/, /b/, or /r/. The initial consonants of the syllables preceding the nonmetathesized clusters are /ts/, /β/, /r/, or /n/. The hypothetical strength scale devised for the initial consonants of preceding syllables in environment 1 (see Table 5) is used for the initial consonants in environment 2 as follows in Table 12.

Consonant	C Coronal	C Continuant	⊃ Lingual	Total weight
/k/	(-) 3	(-) 2	(+) 1	6
/p/,/b/	(-) 3	(-) 2	(-) -1	4
/t/	(+) -3	(-) 2	(x) 0	-1
/r/	(+) -3	(x) 0	(x) 0	-3
/n/	(+) -3	(x) 9	(x) 0	-3
/β/	(-) 3	(+) -2	(-) -1	0
/ts/	(+) -3	(-) 2	(x) 0	-1

Table 12: Relative weights for consonants in initial position

In medial position, the consonant preceding /r/ or /l/ is /p/, /b/, /t/, /k/, /g/, or /d/. The hypothetical strength scale devised for consonants preceding liquids in environment 1 (see Table 6) is applied here in Table 13 to consonants preceding liquids in environment 2.

Consonant	⊃ Lingual	⊃ Voiced	⊃ Continuant	Total weight
/b/	(-) -3	(+) 2	(-) -1	-2
/p/	(-) -3	(x) 0	(-) -1	-4
/t/	(x) 0	(x) 0	(-) -1	-1
/k/	(+) 3	(x) 0	(-) -1	2
/g/	(+) 3	(+) 2	(-) -1	4
/d/	(x) 0	(+) 2	(-) -1	1

Table 13: Relative weights for consonants in medial position

The segments /m/ and /n/, which precede the clusters with the liquid in environment 2, must be considered separately from the other consonants since they prevent the assimilation process. This does not necessarily result from the feature nasality. In environment 3, assimilation also is prevented, but the consonant preceding the medial cluster with the liquid is a sibilant (/s/). Therefore, in order to make a significant generalization about their role, the segments /m/, /n/, and /s/ should be considered together and weighted according to their common features. These features are, by preferential order: [⊃Continuant], [⊂Lingual], and [⊂Grave]. The hypothetical weights for /m/, /n/, and /s/ are given in Table 14.

Consonant	⊃ Continuant	⊂ Lingual	⊂ Grave	Total weight
/m/	(x) 0	(-) 2	(x) 0	2
/n/	(x) 0	(x) 0	(-) 1	1
/s/	(+) 3	(x) 0	(-) 1	4

Table 14: Relative weights for /m/, /n/, and /s/

Vowels will receive the same weights they received in environment 1 (see Tables 7 and 8), since the same conclusions about their roles apply to environment 2. A calculation of the total weight of the syllables in environment 2 now can be given in Table 15.

Corpus	First syllable	Second syllable	Total weight	Gascon forms
29. comprā́re	6 + 1 + 2	-4 + 0 + 3	9 $ -1	crombá
30. cámbra	6 + 3 + 2	-2 + 0 + 1	11 $ -1	cráamba
31. (ex)combrā́re	$6 + 1 + 2	-2 + 0 + 3	9 $ 1	escrumbá
32. bentre	4 + 3 + 1	-1 + 0 + 1	8 $ 0	bréntе
33. furúnclu	$-3 + 3 + 1	2 + 0 + 1	1 $ 3	hloróonc/roungou
34. tempráre	-1 + 1 + 2	-4 + 0 + 3	2 $ -1	trembá
35. bembrā́re	4 + 1 + 2	-2 + 0 + 3	7 $ 1	brembá
36. spíngla	4 + 3 + 1	4 + 0 + 1	8 $ 5	esplíngo
37. cáncru	6 + 3 + 1	2 + 0 + 1	10 $ 3	cránc
40. cíngla	-1 + 3 + 1	4 + 0 + 1	3 $ 5	sínclo
41. divéndris	$ 0 + 3 + 1	1 + 0 + 1	4 $ 2	dieúndres
42. hirúngla	$-3 + 3 + 1	4 + 0 + 1	1 $ 5	hurúnglo
43. numbrósi	-3 + 1 + 2	-2 + 0 + 3	0 $ 1	numbrúbi

Table 15: Calculation of the weights of the first and second syllables in environment 2

As can be seen from Table 15, metathesis occurs whenever the syllable preceding the medial cluster with the liquid is heavier than the syllable to which the cluster with the liquid belongs. In examples 40, 42 and 43, the cluster with the liquid belongs to a syllable which is heavier than the preceding one and metathesis does not take place. In example 41, however, the syllable preceding the cluster with the liquid is heavier but metathesis does not take place.

Example 33 (furúnclu) presents several problems:

(1) Its derivation in Gascon has, in addition to an expected nonmetathesized form roungou (where the syllable with the cluster is heavier), a metathesized form horónc.

(2) In furúnclu > horónc, the metathesized /l/ does not move to the preceding syllable, but to the initial syllable of the word. The metathesis process could be decomposed into a series of changes as follows: furúnclu > *furlúncu > fluruncu. However, to my knowledge, no historical evidence exists to suggest that at one point in its phonology, Gascon did not allow a medial cluster /rl/. We know, however, that Gascon did not favor a cluster cl = [kl], and that the presence of a preceding n in furúnclu prevents the palatalization and assimilation of /k/ to the adjacent /l/. In modern Gascon, one variant reflex of the word is frenke (Millardet 1971: 229). In Old French, furúnclu > froncle (Bourciez: 1974). According to Bourciez (page 42), in initial syllable position before /r/, a vowel was dropped in Vulgar Latin for some words. For example, directum > *d'rectu 'right' and *corrotulāre > c'rotulare 'to collapse.' It may be that in Vulgar Latin, furúnclu > *frúnclu

(where /r/ is a syllabic liquid). In *frunclu, the syllable with the cluster cl is weaker by position than the initial (stressed) syllable of the word, and metathesis applies in Gascon by position, if not by weight. Note also that Bec (1968) and Rohlfs (1970) posit a metathesized form in Latin (*fluruncum), and that the modern reflexes of Latin furúnc(ŭ)lum are floróńco in Catalan, florénco in Aragonese, and floróńc in Old Provençal.

4.4.2.1 Discussion of some additional words in environment 2

Two words remain to be accounted for in the discussion of syllable weights: (38) tén(ĕ)ru > tréndo and (39) gĕn(ĕ)ru > jéndre. The problem here is that two rules seem to conflict.

As part of the phonology in Gascon, /n/ was deleted intervocalically (see § 2.4). Luchaire (1881) listed the following derivations for gĕn(ĕ)ru: gier (in Le Livre d'Or, 1265) and gendre (in Le Cartulaire de Sainte Croix, 1290). It has also been proposed that proparoxytone syncope took place at the end of the 3rd century so that Latin ténĕru, gĕnĕru became *ténru, *génru, subsequently giving rise to an epenthetic /d/ (*téndru, *géndru). Of the two sound changes described (i.e., the deletion of intervocalic /n/ and syncope), the latter seems most likely to have affected the words under discussion. Since syncope of posttonic ĕ took place in Latin (see § 3.2), whereas the deletion of /n/ occurred in Gascon, the latter process must have developed after the Latin sound change.

One explanation for this conflicting derivation can be found in the deletion of /n/. Rohlfs (1970: 156) explained that /n/ was deleted in intervocalic position throughout Gascony except in the geographical area of the Gironde (see Appendix A). It may be that during the syncope process, the unaccented vowel ĕ of gĕn(ĕ)ru, for example, went first through the stage e > /ə/ before disappearing. This would explain why, in some cases, gĕn(ĕ)ru became gier (since tonic é regularly diphthongized to ie in an open syllable) and why, in other cases, tonic é remained /e/ in a closed syllable (due to the intrusion of an epenthetic /d/, e.g.,

géndru). In the case of gier, intervocalic /n/ deleted as expected. Also, since epenthesis has been dated as occurring around the end of the 4th century, it may be that the deletion of intervocalic /n/ in Gascon took place before that time.

In any event, whether we consider the above explanation correct or whether the two words were introduced in the Gascon lexicon at an undetermined later date, the fact remains that only one word metathesized. These two words therefore may be discussed in terms of their syllable weights to determine whether or not metathesis could have applied. In the calculation of the syllable weights, a new weight needs to be added to Table 12 in the case of the initial consonant in (39) (gen͡eru). Latin /g/ became /j/ before /e/ around the end of the 3rd century (La Chaussée 1974: 175). The weight of /j/ is calculated as follows: -3 ([- Coronal]) + 0 ([x Continuant]) + 0 ([x Lingual]) = -3. A calculation of the syllable weights in the two words is given in Table 16.

Corpus	First syllable	Second syllable	Total weight	Gascon forms
38. téndru	-1 + 3 + 1	1 + 0 + 1	3 $ 2	tréndo
39. jéndru	-3 + 3 + 1	1 + 0 + 1	1 $ 2	jéndre/yéndre

Table 16: Calculation of the weights of the first and second syllables in téndru and jéndru

As can be seen from the calculation, in (38) the first syllable is heavier and metathesis occurs. In (39), the second syllable is heavier and no metathesis occurs.

4.4.3 Discussion of metathesis in environment 3

A list of words given in § 3.1 (C) is repeated below. Each Latin form of the word is given under its intermediate stage as discussed in § 3.2.

	Latin	Gascon	
44.	cǎbístru	crabéste	'head'
45.	castrṓne	crestón	'castrated lamb'
46.	castrā́re	crestá	'to castrate'
47.	castrā́tum	crestát	'castrated horse'
48.	cástra	cráste	'ditch'
49.	cúscliu	clósque	'shell'
50.	véspras	bréspes	'evening'
51.	vespráclu	brespálh	'evening snack'
52.	vesprizā́re	brespeyá	'to taste'
53.	fĕnéstra	hriéste	'window'
54.	pistrī́re	prestí	'to press'
55.	pésslu	plésc	'lock'
56.	misclā́re	meslá	'to mix'

In examples 50, 51, and 52, Latin /v/ > Gascon /b/ in initial position (see § 2.4). In example 53, /n/ is deleted in intervocalic position (fĕnéstra > *fiéstra). In example 55 (pésslu), sl > *stl > scl (Ronjat 1932: 163).

The medial clusters in environment 3 are the same as those in environment 2. Therefore, the same strength scale for consonants in

medial positions (see Table 13) will be used. The initial consonants of the syllables preceding the clusters also are identical to those in environment 2 and will receive the same weights as given in Table 12. A new weight, however, is added to Table 12 for the initial consonant in (56) (<u>misclāre</u>): /m/ = 3 ([- Coronal]) + 0 ([x Continuant]) + (-1) ([- Lingual]) = +2

The vowels in environment 3 receive the same weights as in the previous two environments (see Tables 7 and 8). The weight of the sibilant (/s/) was determined in Table 14. A calculation of the total weights of syllables for words in environment 3 is given in Table 17.

	Corpus	First syllable	Second syllable	Total weight	Gascon forms
44.	căbístru	$ 4 + 3 + 4	-1 + 0 + 1	11 $ 0	crabéste
45.	castrōne	6 + 1 + 4	-1 + 0 + 3	11 $ 2	crestón
46.	castrāre	6 + 1 + 4	-1 + 0 + 3	11 $ 2	crestá
47.	castrātum	6 + 1 + 4	-1 + 0 + 3	11 $ 2	crestát
48.	cástra	6 + 3 + 4	-1 + 0 + 1	13 $ 0	cráste
49.	cúscliu	6 + 3 + 4	2 + 0 + 1	13 $ 3	clósque
50.	béspras	4 + 3 + 4	-4 + 0 + 1	11 $-3	bréspes
51.	bespráclu	4 + 1 + 4	-4 + 0 + 3	9 $-1	brespálh
52.	besprizāre	4 + 1 + 4	-4 + 0 + 1	9 $-3	brespeyá
53.	fiéstra	0 + 3 + 4	-1 + 0 + 1	7 $ 0	hriéste
54.	pistrīre	4 + 1 + 4	-1 + 0 + 3	9 $ 2	prestí
55.	pésklu	4 + 3 + 4	2 + 0 + 1	11 $ 3	plésc
56.	misclāre	2 + 1 + 4	2 + 0 + 3	7 $ 5	mesclá

Table 17: Calculation of the weights of the first and second syllables in environment 3

In examples 44 through 55, the syllable preceding the cluster with the liquid is heavier and metathesis occurs. In example 56, the syllable with the liquid is lighter but metathesis takes place.

In example 44 (*căbístru* > *crabéste*), the metathesized /r/ does not move to the preceding syllable, but to the initial syllable of the word. It appears, however, that metathesis may have occurred twice for this word. Thus, in a first stage, we can posit that *cabístru* > **cabrístu*; then, in a second stage, **cabrístu* > *crabéste* (where secondary /b/ (i.e., /b/ < /p/) does not undergo assimilation. A calculation of syllable weights for each of these two proposed stages of metathesis follows in Table 18. The weights used for the consonants and vowels were determined in Tables 7, 8, 12, 13, and 14. Note that the hypothetical weight assigned in each stage to /b/ differs. This is because during the first stage, /b/ is in the initial position of the syllable that precedes the cluster containing the liquid, whereas in the second stage /b/ immediately precedes the liquid /r/.

	First syllable	Second syllable	Total weight
First stage:			
$ bís $ tru:	4 + 3 + 4	-1 + 0 + 1	11 $ 0
Second stage:			
ca $ brí :	6 + 1	-2 + 0 + 3	7 $ 1

Table 18: Calculation of the weights of the first and second syllables in *cabístru* at two stages

4.5 Rule-account of metathesis in Gascon

In environment 1, in 17 words the first syllable is heavier than the second and metathesis occurs. In word 18 (febr(ŭ)árius), both syllables have the same weight but metathesis occurs in an alternate form of the word (hérbe). In 8 words in environment 2, the first syllable is heavier than the second and metathesis occurs. In 33 (furúnc(ŭ)lu), the preceding syllable is lighter than the syllable with the Stop + Liquid cluster, but metathesis occurs in one alternate form of the word (hlorónc). Recall, however, that the syllable preceding the cluster with the liquid is accented and thus heavier by position. In (41) (*divéndris), the preceding syllable is heavier but metathesis does not occur. In the 4 words remaining in environment 2 (examples 39, 40, 42, and 43), the first syllable is lighter than the second and metathesis does not occur. Finally, of 13 words in environment 3, the first syllable is heavier than the second in examples 44 through 55 and metathesis occurs in these words. In 56 (mesclá), the first syllable is heavier than the second but metathesis does not occur. A tabulation of the results of syllable weighting is given in Table 19.

Environment 1:	Number of examples	Examples exhibiting metathesis
1st syllable ≥ 2nd	18	18
Environment 2:		
1st syllable > 2nd	10	9
1st syllable < 2nd	5	1 (alternate form)
Environment 3:		
1st syllable > 2nd	13	12

(Note that > means "bigger than", ≥ means "bigger or equal to", and < means "smaller than")

Table 19: Occurrence of metathesis in relation to syllable weight

The calculation in Table 19 yields the following results in Table 20.

Environment 1, 2, 3	Number of examples	Number of examples exhibiting metathesis	Percent metathesis
1st syllable ≥ 2nd	41	39	90.5
1st syllable < 2nd	5	1	20

Table 20: Percentage of metathesis occurrence

Based on this analysis of the data, I propose the following rule (Rule 5) for predicting the occurrence of metathesis in Gascon: In a consonant cluster which begins a noninitial syllable, a liquid moves across syllable boundaries to the preceding syllable if that syllable is heavier than the syllable to which the liquid originally belongs.

Rule 5: Metathesis in Gascon

$ C V (C) $ C L V ⟶ 1 2 7 3 4 5 6 8

1 2 3 4 5 6 7 8

Condition: 1234 > 5678

4.6 Conclusion

The purpose of this study was twofold: first, to establish that metathesis is a natural phonological process arising from the phonotactic constraints of languages. Second, to demonstrate, using a case study of Gascon, that metathesis is a systematic and predictable sound change that is rule governed.

Many reasons have been suggested for rejecting metathesis as a viable phonological process. Previous studies on metathesis have been criticized for abstractness of analysis, selection of random cases, failure to classify examples into definite categories or types, and failure to study metathesis within the overall phonological pattern of the language involved. Because of such objections, metathesis generally has been conceived of as a sporadic sound change reflecting a phonetic output, and not as a true phonological process.

In this study, I used an analysis of diachronic processes in related dialects of Eskimo to argue that metathesis can be considered a natural phonological process following regular patterns within a language. Using Gascon, a dialect of Occitan selected because of its numerous examples of metathesis, I investigated the process further. Two previous analyses of Gascon metathesis by Grammont were shown to be unsuccessful in accounting for all instances and absences of metathesis in that language. A broad list of examples of metathesis in Gascon was collected and classified into three environments. The historical processes that affected Gascon were discussed, in order to focus the analysis of the data. These processes exemplified the spirantization of voiced stops before the liquid /r/, the voicing of voiceless stops before /r/, and the spirantization of the newly voiced stops before /r/.

Two alternative theories were applied to the data in order to account for the process of metathesis observed in Gascon. These theories were (1) the generative phonology of Chomsky and Halle and (2) the sociolinguistic theory. The generative-model approach failed to provide a satisfactory account of changes exhibited in the data. No systematic explanation could be provided for metathesis by using distinctive features, and no coherent pattern of metathesis emerged. The sociolinguistic theory advocated by Bailey was found to be a more favorable model for explaining metathesis in Gascon. The model emphasizes existing constraints on the application of a rule, and states that these constraints can vary through time or processes. It claims that a sound has only a relative strength depending on what processes or environments are involved.

I supplemented Bailey's sociolinguistic theory by proposing a method for weighing syllables according to their position and the sound segments comprising them. The analysis of the data under this modified theoretical approach produced the following results:

(1) In the case of those historical processes discussed previously -- where the initial consonant of medial clusters such as /tr, dr/ and /pr, br/ was voiced, spirantized, and finally assimilated -- the features pertinent to the assimilation process were shown to be modified through time: e.g., primary /b/ assimilated in Gascon but secondary /b/ did not (except in the environment of a following vowel /u/).

(2) A set of features based on Bailey's notational system appeared to explain why secondary /b/ no longer had preferential features for assimilation: the hierarchical order of constraints favoring assimilation had been reordered.

(3) Because the constraints favoring assimilation were reordered and this reordering led to a limitation in the occurrences of assimilation, metathesis took place with respect to secondary /b/. Metathesis also occurred in all other cases where assimilation did not occur.

(4) Therefore, the data analysis suggests that metathesis in Gascon did not occur randomly but followed a definite pattern. Metathesis took place for reasons similar to those for assimilation, but as an alternative to such a process. Both metathesis and assimilation, which affect the same sound segments, occurred in response to the phonotactic constraints in Gascon. Assimilation occurred only when the consonant cluster with the

liquid was in intervocalic position. Metathesis, on the other hand, took place when the cluster was preceded by a nasal or a sibilant.

Hence, the theory I propose accounts for all constraints placed on metathesis. The presence of a nasal or a sibilant ensured the occurrence of metathesis (otherwise, clusters like /tr, dr, kl, gl/ would have assimilated). For either metathesis or assimilation to occur, the liquids /r/ and /l/ must have been part of the medial consonant clusters. The fact that metathesis did not take place in the case of a word starting with a vowel indicates that a consonant in word initial position was required for metathesis to apply. Furthermore, the fact that metathesis took place in teń(ĕ)ru > Gasc. tréndo but not gén(ĕ)ru > Gasc. jéndre (see Table 16), where both words have similar segments except for the initial consonant, indicates a constraint on those features belonging to the initial consonant of the syllable that preceded the medial consonant cluster. The analysis of metathesis in terms of syllable weight both explains how metathesis depends on the sum of the enumerated constraints and supports strongly my claim that the difference in weight between two contiguous syllables is responsible for this process. Thus, my proposed syllable weight approach applies to all instances and absences of metathesis in Gascon. It is able to predict its occurrence under a single rule, accounting for all possibly relevant environments.

The approach of weighing syllables suggests a method that may be used to explain metathesis in other languages. In any case, the results obtained in this study of the Gascon dialect of Occitan provide strong evidence that metathesis is a natural phonological process that can be accounted for systematically and explained.

APPENDIX A: map of Gascony

APPENDIX B: features

The features employed in the present study are a partial set of Bailey's ternary-valued features (1973: 110-25). The relevant features are described below in alphabetical order.

Accent:

A fully accented vowel is [+ accent]. A midaccented vowel is [x accent] (e.g., a vowel with secondary stress). A nonaccented vowel is [- accent].

Continuant:

Fricatives and liquids other than taps are [+ continuant]. Semi-continuants such as non-steady-state continuants and semistops (glides, the glottal stop, taps, and nasal sonorants) are [x continuant]. Occlusives (including n^d, t^s, t^l, and t^h) are [- continuant].

Coronal:

Apical consonants (i.e., those articulated with the apex of the tongue) are [+ coronal]. Sibilants (i.e., s, z, , ʃ, ʒ) are [x coronal]. Labial, labiodental, palatal and velar consonants are [- coronal].

Grave:

Backrounded vowels and labialized velars, rounded labials (including /w/), and velarized apicals or labials are [+ grave]. Central and back-unrounded vowels and unrounded velar, postvelar, and labial consonants are [x grave]. Front vowels and apical and palatal consonants are [- grave].

Lingual:

Dorsal consonants (i.e., those articulated with a convex dorsum) are [+ lingual]. Apical consonants are [x lingual]. Labial consonants are [- lingual].

Liquid:

Lateral consonants are [+ liquid]. Grooved consonants are [x liquid]. Consonants articulated with an undeflected oral air stream are [- liquid].

Low:

Low vowels are [+ low]. Mid vowels are [x low]. High vowels are [- low].

Nuclear:

A vowel is [+ nuclear], a semivowel is [x nuclear], and consonants are [- nuclear].

Round:

An overround segment like /b^w/ or /m^w/ is [+ round]. A plain rounded segment like /w/ or /b/ is [x round]. An unrounded segment is [- round].

Vibrant:

Trilled consonants (like /r/ in Spanish burro) are [+ vibrant]. Tapped or flapped consonant (like Vulgar Latin /r/) are [x vibrant]. All other consonants are [- vibrant].

Voiced:

Voiced consonants are [+ voiced].Voiceless consonants are [x voiced]. Aspirated consonants (like Gascon /h/) are [- voiced].

APPENDIX C: distinctives features

1. Distinctive features of consonants

/p/	:	- continuant	/b/	:	- continuant
		- coronal			- coronal
		- lingual			- lingual
		x grave			x grave
		x voiced			+ voiced
/t/	:	- continuant	/d/	:	- continuant
		+ coronal			+ coronal
		x lingual			x lingual
		- grave			- grave
		x voiced			+ voiced
/k/	:	- continuant	/g/	:	- continuant
		- coronal			- coronal
		+ lingual			+ lingual
		x grave			x grave
		x voiced			+ voiced
/f/	:	+ continuant	/g^w/	:	- continuant
		- coronal			- coronal
		- lingual			+ lingual
		x grave			+ grave
		x voiced			+ voiced

/m/ : x continuant
- coronal
- lingual
x grave
+ voiced

/n/ : x continuant
+ coronal
x lingual
- grave
+ voiced

/s/ : + continuant
x coronal
x lingual
- grave
x voiced

/ts/ : - continuant
+ coronal
x lingual
- grave
x voiced

/j/ : x continuant
- coronal
x lingual
- grave

/l/ : + continuant
+ coronal
x lingual
- grave
- vibrant
+ liquid

/r/ : x continuant
+ coronal
x lingual
- grave
x vibrant
x liquid

2. Distinctive features of vowels

/a/ : + nuclear
x grave
+ low
- round

/e/ : + nuclear
- grave
x low
- round

/i/ : + nuclear
- grave
- low
- round

/o/ : + nuclear
+ grave
x low
x round

/u/ : + nuclear
+ grave
- low
+ round

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